3.3.1 Forest Type and Age Management Indicator Habitats 1-10

Analysis Area

The analysis area for considering direct and indirect effects for Forest Type and Age Management Indicator Habitats (MIH) 1-9 includes land managed by the Chippewa and Superior National Forests. On the Superior this includes the BWCAW. For MIH 10, direct and indirect effects are analyzed only for the lands outside the BWCAW, though cumulative effects analysis addresses the contribution of the wilderness.

The areas covered by cumulative effects analysis for the Chippewa NF is land of all ownerships within the Drift and Lake Plains Section. For the Superior NF it includes all lands within the Northern Superior Uplands Section.

Overview of Indicators 1-10

Indicators 1-10 were selected because each provides an approximation of amount, distribution, and trend of forested habitat types that are at issue in plan revision. This is mainly because all alternatives propose timber harvest, prescribed fire, vegetation succession, and other vegetation activities. Thus MIHs 1-10 would vary by alternative.

For those forest types that are not predicted to change type or age because they are not classified as timber suited land (white cedar) or because timber treatments do not change their age in the forest inventory (black ash), are not included because they do not vary by alternative. This is not to say that these forest types do not provide important habitat for many species. For sensitive species associated with cedar and black ash, analysis of these forest types is conducted in the Biological Evaluation (USDA Forest Service 2004e, planning record).

Each MIH is compared to and evaluated against current conditions and the estimated range of natural variability during the time period 1600-1900AD. Conclusions are drawn about 1) the likelihood of an alternative maintaining adequate ecosystem representation of these habitats to provide for species maintenance and 2) what species habitats are emphasized in an alternative to provide for social, economic and ecological benefits and uses. These indicators are useful for comparing alternatives because each alternative varies in the amounts of forest type and age management indicator habitat expected over time.

Predictions of current and future potential acres of Indicators 1-10 outside the Boundary Waters Canoe Area Wilderness (BWCAW) are from Dualplan (see Appendix B: *Modeling Ecosystems* for more detailed explanation of model). Dualplan models vegetation treatments, primarily logging, natural vegetation succession, and some insect and disease mortality. It does not predict or measure changes based on other natural processes such as drought, flooding, fire or extensive blowdowns.

Within the BWCAW on the Superior NF, current and future Indicator 1-9 condition predictions are from the Fire Effects Tradeoff Model for BWCAW Fuel Treatment Final EIS (USDA Forest Service 2001a). This model predicts vegetation conditions based on both natural disturbance and objectives for prescribed burning in the BWCAW (USDA Forest Service 2001a). The Superior National Forest, through the Final EIS, acknowledges that predicting future fire and wind, including size, location, and intensity, is difficult.

The measure of young outside the BWCAW assumes young forest is established through logging and is from Dualplan. In the future, undoubtedly wildland and prescribed fire and wind will continue to contribute to this age group; however, Dualplan does not predict or measure this.

Indicator data are displayed in Chapter 3 aggregated to a Forest-wide landscape scale for Decades 2 and 10. Appendix D provides Forest-wide data for Decades 2, 5, and 10. The planning record contains data for Decades 1, 2, 5, and 10 for the full spectrum of age groupings, disaggregated to Landscape Ecosystem scale.

This section also identifies species of management concern associated with Indicators 1-10 (Tables WLD-1 through WLD-10). More detailed information on species selection, species habitat needs, risks to species, species status, population abundance, distribution, and trends is documented in Appendix B: *Wildlife*, Appendix D, the planning record (USDA Forest Service 1997e, 2002b, 2004b, 2004e), and in Sections 3.3.2-3.3.6 for select species.

Assumptions and limitations of Indicators 1-10

Management Indicator Habitats (MIH), Species Populations, and Monitoring

For purposes of analysis, use of Indicators 1-10 assumes that, in general, there is a correlation between amount of management indicator habitats (MIHs) and potential species populations. MIHs provide a coarse filter approximation of the amount of potentially suitable habitat (refer to 3.3.0: How Management Indicator Species are Addressed and Chapter 3.1.3: Range of Natural Variability for information on coarse filter ecosystem management approach). The use of MIHs as surrogate measures acknowledges that habitat for each of thousands of species is a unique combination of vegetation and other features that are often not readily detected by forest type and age alone. Because of this complexity, the use of MIHs provides a simplified, practical and reasonable approach to address a broad spectrum of species at the programmatic level.

Where impacts to wildlife were not adequately addressed by this coarse filter approach, the species-specific analyses (Section 3.3.4 to 3.3.6) complement MIHs 1-10 providing a fine filter evaluation.

An important component of this approach is monitoring (Forest Plans, Chapter 4). Because MIH, together with MIS, provide the basis for addressing requirements to maintain viability in the planning area of all native and desired non-native species, MIHs and some associated species would be monitored. MIHs would be monitored to address the degree to which the plans implement MIH objectives. Associated species would be monitored to validate assumptions and predictions about population and habitat links.

An example of ongoing species monitoring is the Forest Birds of the Western Great Lakes States long-term monitoring project (Natural Resources Research Institute, 2003, www.nrri.umn.edu/mnbirds/). This collaborative project monitors song birds with over 1600 off-road sampling points designed to track regional population trends. This effort also is investigating the response of forest birds to regional land use patterns (including those that result from National Forest vegetation management) and developing techniques to analyze spatial and temporal relationships between distribution and abundance of forest birds to forest habitat features at the stand and landscape levels. Birds that have an adequate statistical link to MIHs are identified in Tables WLD-1-10. Other ongoing efforts include monitoring of game species by the Minnesota DNR.

MIHs and Range of Natural Variability

Amounts of Indicators 1-9 estimated to be present historically (1600-1900 AD) under the range of natural variability are based on Frelich (1999, 2000) and Host *et al.* (2001), and the Minnesota Forest Resources Council (1999b, 2000).

A key assumption we apply in evaluating MIHs 1-10 is that ecological conditions are likely to provide for species viability and maintain well-distributed habitats if there is an adequate representation of the range of habitats that would have been present under the range of natural variability (USDA Forest Service, Committee of Scientists 1999, also refer to Chapter 3.1.3 and Appendix G for description of coarse filter management and the use of range of natural variability as a tool for evaluating impacts).

Although we assess the adequacy of representation of MIHs in this section, specific ecological thresholds for viability of species are not identified. This is because of ecological complexity and uncertainty associated with addressing species viability through MIHs only. Instead, determination of likelihood of viability was assessed for those species at highest risk of loss of viability, the threatened, endangered, and sensitive species. This assessment considered a wider range of habitats and impacts of activities than those represented by MIHs.

Beyond evaluating the likelihood of adequate representation of habitats to sustain all wildlife, the evaluation of amounts and distributions of wildlife habitats are largely a social question to address the issue of what species habitats should be emphasized to provide for the many social, economic, and ecological uses and values of wildlife.

Forest type and age

The following describes the additional assumptions used in considering type and age:

Forest Type

Forest typing is a practical, if ecologically very generalized, classification of distinct associations of trees on the landscape. It allows us to estimate amounts of forests. Likewise, use of forest types (combined with age) as indicators for wildlife assumes they are a reasonable representation of general habitat types.

Most forest types, however, are much more diverse in composition than are indicated by assigned types. Therefore we assume that the forest type indicator reflects the dominant canopy tree species and that many other species of trees may be present as either co-dominant species or less common associates. Depending on Landscape Ecosystem and context, origin of stand, human influences, and other factors, forest types also have predictable associations of shrubs, ground layer plants, and other features.

Identification, description, and ecology of the National Forests' native plant communities, both under the range of natural variability and under the dominant human influences of the last century, are described generally in Chapter 3.2 Vegetation and in more detail in Minnesota DNR (2003) and for the Chippewa by Almendinger and Hanson (1998) and Frelich (2000) and for the Superior by Rusterholtz (2002), Frelich (1998a, 1999) and USDA Forest Service (2001a).

Forest Age Group

Indicators 1-10 provide a measure of wildlife habitats indicated by forest types grouped in two different ages or structural stages to represent key wildlife habitats most at issue. See Appendix D for details on how individual forest types were grouped by age. The planning record provides data on the full range (five) of age groupings.

Young forest

Young forest represents the seedling or stand initiation stage of forest growth. The surrogate for this stage in upland forest is the 0-9 year age class and in lowland forest types is 0-19 years.

Under the range of natural variability, fire and wind most frequently initiated seedling forests, but drought, flooding, and insect infestation also contributed (Frelich 1999). In the last 100 years, initiation of young forest outside the BWCAW has been primarily through logging (Heinselman 1996), but also through a small amount of burning and land clearing for development or agriculture with subsequent reforestation. Additionally, factors such as fire suppression have influenced the character of the regenerating seedling forests (Frelich 1999, Almendinger and Hanson 1998, Minnesota DNR 2003).

Within the BWCAW, about half of the area sustained some logging prior to 1975 (Ohman and Ream 1971), but wind and fire have been, and remain, the primary factors in creating young forest. In particular, on July 4, 1999, a windstorm affected approximately 367,000 acres, creating thousands of acres of young forest (USDA Forest Service 2001a).

Features of young forest may differ widely depending on landscape ecological context and the processes that establish it – whether human-caused or natural/ ecological. (USDA Forest Service 2001a, Schulte and Niemi 1998, Bergeron *et al.* 1998 at http://www.ecologyandsociety.org/vol2/iss2/art6/index.html, Frelich and Reich 1998, Frelich and Reich 1995a).

Generally, key features of young forest established by human management include:

- Small seedling trees (abundant)
- Open canopy
- Distinct mixtures of plant and animal species
- Standing dead and live trees and other vegetation remnants of the original forest stand
- Downed wood and branches
- Disturbed ground

Young forests established by natural disturbances are similar, but generally have greater amounts of standing dead and live trees and other vegetation remnants of the original stand, more large downed trees, and different vegetation associations.

Mature/old forest

Mature/old forest represents a combination of three growth stages of forests: mature, old/old growth and old/multi-aged (including understory initiation stage). The age at which we have assumed each forest type enters one of these stages is documented in Appendix D and is based on information from classification of vegetative growth stages of Landscape Ecosystems and other scientific sources. The youngest of these stages, mature, begins from 40 to 60 years old depending on the forest type. The oldest age group, old/multi-aged, begins at 150 years for all types except jack pine and aspen-birch which enter the old/multi-aged group at 80 years.

These age groupings address habitat requirements for many species of management concern and provide a Forest-wide look at ecologically similar growth stages. Appendix D shows the acres by each of the three age groups separately for mature/old forest outside the BWCAW. The BWCAW Final EIS (USDA Forest Service 2001a) provides detail for forests within the BWCAW. Chapter 3.2: Vegetation also provides information on differences in forests in these different stages.

Under both human management and the range of natural variability, mature/old forests develop from aging and vegetation succession. However, their diversity of composition, structure, and ecological processes may vary widely depending on factors such as stand origin, human influences, and Landscape Ecosystem context (Schulte and Niemi 1998, Bergeron et al. 1998, Frelich and Reich 1998, Frelich and Reich 1995b Almendinger and Hanson 1998). Today's upland mature/old forests, in particular, are generally more simplified, less structurally diverse, and have significant changes in species association compared to those under the range of natural variability (USDA Forest Service 1996c, Frelich 1995).

In general, features of mature/old forest include:

- Large and old trees
- Trees of various ages
- Moderate to closed canopy from overstory trees, with older forests commonly developing frequent canopy gaps from windfall or other tree mortality
- Distinct mixtures of plant and animal species
- Standing dead and dying trees
- Downed wood
- Tip-up mounds (uprooted tree stumps)

Depending on natural processes or human influences, in general, the older the forest, the larger the canopy-layer trees, the greater the amount of dead and dying, standing and downed trees, and the more structurally complex the forest.

In summary, because there are no readily available or practical methods for measuring the full complexity of habitat features, indicators of forest types and age groups are useful because they do a reasonable job of highlighting differences among the alternatives in many wildlife habitats. They indicate trends on forest vegetation from impacts of management – whether logging, tree planting, succession, or, in the BWCA,

from expected natural disturbances and vegetation succession.

3.3.1.a Affected Environment for Management Indicator Habitats 1-10

Figures WLD-1a through 10b display the existing condition of MIHs 1-10. These figures also display the estimated range of natural variability for MIHs 1-9. Figures for MIHs 1-9 for the Superior also display the acres outside the BWCAW in relationship to the acres inside. Tables that show numbers and percentages of MIHs for existing condition and decades 2, 5, and 10 are found in Appendix D. The planning record also provides information at the Landscape Ecosystem scale specifically for Indicators 1-10 at existing condition and decades 1, 2, 5, and 10.

Under the range of natural variability (1600-1900 AD), the amounts, quality, and distribution of MIHs resulted from the three primary factors that shaped the forests of northern Minnesota: climate, unique soil and landform combinations, and disturbances (Frelich 1998a, 1998b, Frelich and Reich 1995a, 1995b). The key role of disturbance in determining the composition, structure, and function of ecosystems – and thus wildlife habitat – is described in Appendix G.

Current conditions are the result of multiple factors. Climate, landform and soil combinations, and natural ecological disturbances and other processes continue to influence current amounts, quality, and distribution of the Indicator habitats. However, human uses and influences, while present for centuries, have increased since the late 1800s and have altered most forest conditions for the Indicator habitats from those within the range of natural variability. During the late 1800s and early 1900s extensive logging, followed by widespread slash-fueled fires, dramatically altered the composition and structure of forests (Jaakko Poyry 1994). Today's forests are strongly influenced by these historical events, more recent logging, human developments, and, probably, factors from outside the area, such as acid deposition and, according to the Environmental Protection Agency, climate change (http://yosemite.epa.gov/OAR/globalwarming.nsf).

Indicator 1 – Upland Forest habitat acres and percent in Young and Mature/Old

Indicator 1 measures acres and percent of upland forest types in young and mature/old forest. This indicator is a summation of all upland forest types and allows evaluation of a broad range of species of concern and interest that may use a variety of upland forest types. It recognizes that many species key in on structural and compositional habitat features that may be present in upland forests regardless of forest type.

Table WLD-1a: MIH 1 – Young upland forest, associated wildlife species of concern. ‡

Superior	Chippewa
Gray wolf, **Lynx**, moose, deer, ruffed grouse, American woodcock, ringneck snake, rose-breasted grosbeak*, veery*, chestnut-sided warbler*, mourning warbler*, American robin*, black-and-white warbler*, alder flycatcher*, Lincoln's sparrow*, song sparrow*, white pine, yellow birch	**Gray wolf**, **Lynx**, moose, deer, ruffed grouse, American woodcock, gray catbird*, indigo bunting*, golden-winged warbler*, rose-breasted grosbeak*, chestnut-sided warbler*, mourning warbler*, song sparrow*, dark-eyed junco*, white pine, yellow birch

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Table WLD-1b: MIH 1 – Mature/old upland forest, associated wildlife species of concern‡

Superior	Chippewa
Northern goshawk, **Lynx**, **boreal owl**, **black-throated blue warbler***, **three-toed woodpecker**, **bay-breasted warbler**, moose, deer, black-backed woodpecker, Blackburnian warbler*, boreal chickadee, pine warbler*, eastern wood pewee*, red-breasted nuthatch*, yellow-bellied sapsucker*, gray jay*, hermit thrush*, red-backed salamander, blue-spotted salamander, wood frog, American marten, pileated woodpecker, barred owl, least flycatcher*, black-throated green warbler*, Canada warbler*, scarlet tanager*, white pine, yellow birch	**Northern goshawk, red-shouldered hawk, black-throated blue warbler, four-toed salamander, goblin fern, black-backed woodpecker, bay-breasted warbler, spruce grouse, Lynx,** red-backed salamander, blue-spotted salamander, wood frog, American marten, pileated woodpecker, barred owl, black-throated green warbler*, great-crested flycatcher*, yellow-bellied sapsucker*, scarlet tanager*, white-breasted nuthatch*, yellow-throated vireo*, American redstart, pine warbler*, eastern wood pewee*, Blackburnian warbler*, brown creeper*, red-breasted nuthatch*, white pine, yellow birch

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Currently, the amount of young upland forest on the Chippewa is above that expected under the range of natural variability (RNV), and well above that expected under RNV on the Superior. The large amount of young upland forest on the Superior is caused in part by the addition of over 100,000 acres of young upland forest in the BWCAW resulting from the July 1999 blowdown (BWCAW Fuels Treatment Final EIS (USDA Forest Service 2001a). Within the first ten years, the currently existing young upland forest in the BWCAW will grow out of the young category. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Mature/Old

Currently, the amount of Mature/Old upland forest is well below the amounts expected under RNV on both the Chippewa and Superior National Forests. Mature/Old upland forest accounts for approximately 49.7% of all upland forest acres on the Chippewa and 52.2% on the Superior.

On the Superior, the total amount of mature/old upland forest actually increases by decade 10 under all of the alternatives. This is caused by a 10% increase in mature/old upland forest inside the BWCAW by decade 2 and a nearly 62% increase inside the BWCAW by decade 10 over current levels (from the 1999 blowdown). This increase has nothing to do with the management activities proposed outside the BWCAW under any of the alternatives. RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 2 – Upland Deciduous Forest habitat acres and percent in Young and Mature/Old

Indicator 2 measures acres and percent of upland deciduous-dominated forest types in young and mature/old. This indicator allows evaluation of species

of management concern that are associated with habitat features of deciduous-dominated forest and whose requirements are not necessarily dominated by one type of deciduous forest over another.

Indicator 2 also is a summation of Indicators 3 and 4.

Table WLD-2a: MIH 2 – Young upland deciduous forest, associated wildlife species of concern. ‡

Superior	Chippewa
Gray wolf, **Lynx**, moose, deer, ruffed grouse, American woodcock, ringneck snake, rose-breasted grosbeak*, veery*, chestnut-sided warbler*, mourning warbler*, American robin*, black-and-white warbler*, white pine	**Gray wolf**, **Lynx**, moose, deer, ruffed grouse, American woodcock, gray catbird*, indigo bunting*, golden-winged warbler*, rose-breasted grosbeak*, chestnut-sided warbler*, mourning warbler*, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Currently, the amount of young upland deciduous forest on the Chippewa is over three times that expected under the range of natural variability (RNV), but within the upper limits of that expected under RNV on the Superior. The large amount of young upland deciduous forest on the Superior is currently inflated with over 12,000 acres of young upland deciduous forest in the BWCAW. Within the first ten years, the currently existing young upland deciduous forest in the BWCAW will grow out of the young category. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Table WLD-2b: **MIH 2 – Mature/old upland deciduous forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Northern goshawk, **boreal owl**, **black-throated blue warbler***, red-backed salamander, blue-spotted salamander, wood frog, American marten, pileated woodpecker, barred owl, least flycatcher*, black-throated green warbler*, eastern wood-pewee*, Canada warbler*, yellow-bellied sapsucker*, scarlet tanager*, white pine, yellow birch	**Northern goshawk, red-shouldered hawk, black-throated blue warbler, four-toed salamander, goblin fern**, red-backed salamander, blue-spotted salamander, wood frog, American marten, pileated woodpecker, barred owl, black-throated green warbler*, great-crested flycatcher*, yellow-bellied sapsucker*, scarlet tanager*, white-breasted nuthatch*, yellow-throated vireo*, American redstart*, white pine, yellow birch

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Mature/Old

Currently, the amount of Mature/Old upland deciduous forest on the Chippewa is at the upper limit of the amount expected under RNV. However, on the Superior, the amount of Mature/old upland deciduous forest is over three times the amount expected under RNV. Mature/Old upland deciduous forest accounts for approximately 35.8% of all upland forest acres on the Chippewa and 34.5% on the Superior.

RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 3 – Upland Northern Hardwood Forest habitat acres and percent in Young and Mature/Old

Indicator 3 measures acres and percent of upland northern hardwood-dominated forest types in young and mature/old. This indicator allows evaluation of species of management concern associated with habitat features of northern hardwoods and whose habitat needs would not be adequately met in aspen-birch dominated forest.

Young

Currently, the combined amount of young upland northern hardwood forest on both forests is a little over 1,100 acres. The amount on the Chippewa is at the upper limit of the amount expected under RNV. However, the amount of young upland northern hardwood forest on the Superior falls within the lower range of the amount expected under RNV. Although no MIH 3 acres register inside the BWCAW, all acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Table WLD-3a: MIH 3 – Young upland northern hardwood forest, associated wildlife species of concern. ‡

Superior	Chippewa
white pine, yellow birch	white pine, yellow birch

‡Source: Planning record

Mature/Old

Currently, the amount of Mature/Old upland northern hardwood forest on the Chippewa is less than one half of the amount expected under RNV. However, on the Superior, the amount of Mature/old upland northern hardwood forest is just slightly below the amount expected under RNV. Mature/Old upland northern hardwood forest accounts for approximately 13.2% of all upland forest acres on the Chippewa and 2.1% on the Superior.

Table WLD-3b: MIH 3 – Mature/old upland northern hardwood forest, associated wildlife species of concern. ‡

Superior	Chippewa
black-throated blue warbler*, least flycatcher*, black-throated green warbler*, blue-spotted salamander, wood frog, barred owl, white pine, yellow birch	**black-throated blue warbler, red-shouldered hawk, four-toed salamander, goblin fern**, blue-spotted salamander, wood frog, barred owl, black-throated green warbler*, great-crested flycatcher*, yellow-bellied sapsucker*, white pine, yellow birch

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 4 – Aspen-Birch Forest habitat acres and percent in Young and Mature/old

Indicator 4 measures acres and percent of upland aspen-paper birch and mixed aspen-birch-spruce-fir dominated forest types in young and mature/old. This indicator allows evaluation of species of management concern associated with habitat features of aspen-paper birch and mixed aspen-birch-spruce-fir dominated forest types and whose habitat needs would

not be adequately met in northern hardwood-dominated forest.

Table WLD-4a: MIH 4 – Young upland Aspen-Birch / Aspen - Birch-Conifer forest, associated wildlife species of concern. ‡

Superior	Chippewa
moose, deer, American woodcock, ringneck snake, rose-breasted grosbeak*, veery*, chestnut-sided warbler*, mourning warbler*, American robin*, black-and-white warbler*, white pine	moose, deer, American woodcock, gray catbird*, indigo bunting*, golden-winged warbler*, rose-breasted grosbeak*, chestnut-sided warbler*, mourning warbler*, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Currently, the amount of young upland aspen/birch forest on the Chippewa is more than three times higher than that expected under the range of natural variability (RNV) and very close to the upper limits expected under RNV on the Superior. The amount of young upland aspen/birch forest on the Superior is enhanced in part by the addition of approximately 9,000 acres of young upland aspen/birch forest in the BWCAW resulting from the July 1999 blowdown (BWCAW Fuels Treatment Final EIS (USDA Forest Service 2001a). Within the first ten years, the existing young upland aspen/birch forest in the BWCAW will grow out of the young category. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Mature/Old

Currently, the amount of mature/old upland aspen/birch on the Chippewa is nearly five times the amount expected under RNV. On the Superior, the amount of mature/old upland aspen/birch is more than three times that expected by RNV. Mature/old upland aspen/birch forest accounts for approximately 21.9% of all upland forest acres on the Chippewa and 32.4% on the Superior. Other than MIH 2 (upland deciduous – which encompasses MIH 4), mature/old aspen/birch accounts for the largest portion of upland forest on both forests.

Table WLD-4b: MIH 4 – Mature/old upland Aspen - birch/Aspen-Birch-Conifer forest, associated wildlife species of concern. ‡

Superior	Chippewa
Northern goshawk, **boreal owl**, red-backed salamander, blue-spotted salamander, wood frog, American marten, pileated woodpecker, barred owl, eastern wood pewee*, yellow-bellied sapsucker*, Canada warbler*, scarlet tanager*, white pine	**Northern goshawk,** red-backed salamander, blue-spotted salamander, wood frog, American marten, pileated woodpecker, barred owl, yellow-bellied sapsucker*, scarlet tanager*, white-breasted nuthatch*, yellow-throated vireo*, American redstart*, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

On both forests, the total amount of mature/old upland aspen/birch forest decreases by decade 2 under all of the alternatives. Unlike the other indicators in this section, this decrease on the Superior would happen even without counting the slight decrease in mature/old aspen/birch inside the BWCAW. RNV on the Superior is based on all National Forest land inside and outside the BWCAW. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 5 – Upland Conifer Forest habitat acres and percent in Young and Mature/old

Indicator 5 measures acres and percent of upland conifer-dominated forest types in young and mature/old. This indicator allows evaluation of species of management concern that are associated with habitat features of conifer-dominated forest and whose requirements are not necessarily dominated by one type of conifer forest over another.

Indicator 5 provides a summation of Indicators 6, 7, and 8.

Table WLD-5a: **MIH 5 – Young upland conifer forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Lynx, **Nabokov's blue,** moose, deer, alder flycatcher*, Lincoln's sparrow*, song sparrow*, tiger beetle, white pine	**Lynx**, deer, song sparrow*, dark-eyed junco*, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Currently, the amount of young upland conifer forest on the Chippewa represents approximately 2.1% of all upland forest on the Chippewa and falls within the lower half of the amount expected under RNV. On the Superior, the amount of young upland conifer forest currently represents approximately 9.9% of all upland forest on the Superior and is more than three times the amount expected under RNV.

The amount of young upland conifer forest on the Superior is caused in part by the addition of approximately 99,400 acres of young upland conifer located within the BWCAW, resulting from the 1999 blowdown (USDA Forest Service 2001a). By the end of decade 2 all of this young conifer will grow out of the young forest category, dramatically adding to the decreases in young upland conifer exhibited by all the alternatives.

RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Table WLD-5b: **MIH 5 – Mature/old upland conifer forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Lynx, **three-toed woodpecker**, **bay-breasted warbler**, moose, deer, black-backed woodpecker, Blackburnian warbler*, boreal chickadee, pine warbler*, eastern wood pewee*, red-breasted nuthatch*, yellow-bellied sapsucker*, gray jay*, hermit thrush*, white pine	**black-backed woodpecker, bay-breasted warbler, spruce grouse**, **Lynx**, pine warbler*, eastern wood pewee*, Blackburnian warbler*, scarlet tanager*, brown creeper*, red-breasted nuthatch*, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Mature/Old

Currently, the amount of mature/old upland conifer forest on the Chippewa is approximately one third of the amount expected under RNV, and the amount of mature/old upland conifer on the Superior is approximately half of that expected under RNV. Mature/old upland conifer forest accounts for

approximately 13.9% of all upland forest acres on the Chippewa and 29.7% on the Superior.

RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 6 –Spruce-Fir habitat acres and percent in Young and Mature/Old

Indicator 6 measures acres and percent of upland spruce-fir and spruce-fir-aspen mix forest types in young and mature/old. This indicator allows evaluation of species of management concern associated with habitat features of spruce-fir dominated forests and whose habitat needs would not be adequately met in pine forests.

Table WLD-6a: **MIH 6 – Young upland spruce-fir forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Lynx, moose, deer, white pine	**Lynx**, deer, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Currently, the amount of young upland spruce/fir forest on the Chippewa represents approximately 0.4% of all upland forest on the Chippewa and falls within the middle of the amount expected under RNV. However, on the Superior, the amount of young upland spruce/fir forest currently represents approximately 7.1% of all upland forest on the Superior and is nearly twenty times the amount expected under RNV.

The amount of young upland spruce/fir forest on the Superior is caused in part by the addition of approximately 75,500 acres of young upland spruce/fir located within the BWCAW, resulting from the 1999 blowdown (USDA Forest Service 2001a). By the end of decade 2 all of this young spruce/fir will grow out of the young forest category, dramatically adding to the decreases in young upland spruce/fir exhibited by all the alternatives.

RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Table WLD-6b: **MIH 6 – Mature/old upland spruce-fir forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Lynx, **three-toed woodpecker**, **bay-breasted warbler**, moose, deer, black-backed woodpecker, Blackburnian warbler*, Swainson's thrush*, boreal chickadee, white pine	**black-backed woodpecker, bay-breasted warbler, Lynx**, deer, Blackburnian warbler*, boreal chickadee, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Mature/Old

Currently, the amount of mature/old upland spruce/fir forest on the Chippewa is approximately one fifth of the amount expected under RNV, and the amount of mature/old upland spruce/fir on the Superior is approximately one third of that expected under RNV. Mature/old upland spruce/fir forest accounts for approximately 2.9% of all upland forest acres on the Chippewa and 14.0% on the Superior.

RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 7 – Red and White Pine Forest habitat acres and percent in Young and Mature/old

Indicator 7 measures acres and percent of upland red pine and white pine forest types in young and mature/old. This indicator allows evaluation of species of management concern associated with habitat features of red and white pine-dominated forests and whose habitat needs would not be adequately met in spruce-fir and spruce-fir-deciduous mixed forests.

Many species that use red and white pine also commonly use jack pine forests, but these are kept as separate indicators in order to address some species that are highly associated with mature/old red and white pines and because the quantity of both jack pine and red/white pine are issues.

Table WLD-7a: **MIH 7 – Young upland red and white pine forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Alder flycatcher*, white pine	Song sparrow*, dark-eyed junco*, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Currently, the amount of young upland red and white pine forest on the Chippewa represents approximately 0.7% of all upland forest on the Chippewa and falls within the lower half of the amount expected under RNV. However, on the Superior, the amount of young upland red and white pine forest currently represents approximately 2.0% of all upland forest on the Superior and is three and one half times the amount expected under RNV.

The amount of young upland red and white pine forest on the Superior is caused in part by the addition of approximately 20,300 acres of young upland red and white pine located within the BWCAW, resulting from the 1999 blowdown (USDA Forest Service 2001a). By the end of decade 2 all of this young red and white pine will grow out of the young forest category, dramatically adding to the decreases in young upland red and white pine exhibited by all the alternatives.

RNV on the Superior is based on all National Forest land inside and outside the BWCAW. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Table WLD-7b: **MIH 7 – Mature/old upland red and white pine forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Blackburnian warbler*, pine warbler*, eastern wood pewee*, white pine	Blackburnian warbler*, pine warbler*, eastern wood pewee*, red-breasted nuthatch*, Canada warbler*, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Mature/Old

Currently, the amount of mature/old upland red and white pine forest on both the Chippewa and Superior is approximately one half of the amount expected under RNV. Mature/old upland red and white pine forest accounts for approximately 8.9% of all upland forest acres on the Chippewa and 4.7% on the Superior.

RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 8 – Jack Pine Forest habitat acres and percent in Young and Mature/old

Indicator 8 measures acres and percent of upland jack pine-dominated forest types in young and mature/old. This indicator allows evaluation of species of management concern associated with habitat features of jack pine-dominated forests and whose habitat needs would not be adequately met in spruce-fir and spruce-fir-deciduous mixed forests.

See Indicator 7 above for rationale for using separate indicators for jack pine and red/white pine.

Table WLD-8a: **MIH 8 – Young upland jack pine forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Nabokov's blue, **tiger beetle,** Alder flycatcher*, Lincoln's sparrow*, song sparrow*	

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Currently, the amount of young upland jack pine forest on the Chippewa represents approximately 1.0% of all upland forest on the Chippewa and falls just below the lower limit of the amount expected under RNV. On the Superior, the amount of young upland jack pine forest currently represents approximately 0.8% of all upland forest on the Superior and is a little more than two-thirds of the amount expected under RNV.

The existing amount of young upland jack pine forest on the Superior includes approximately 3,500 acres of young upland jack pine located within the BWCAW. By the end of decade 2 the amount of young upland jack pine within the BWCAW drops to approximately 400 acres.

RNV on the Superior is based on all National Forest land inside and outside the BWCAW. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Table WLD-8b: **MIH 8 – Mature/old upland jack pine forest, associated wildlife species of concern. ‡**

Superior	Chippewa
spruce grouse, brown creeper*, red-breasted nuthatch*, yellow-bellied sapsucker*, gray jay*, hermit thrush*, black-backed woodpecker, white pine	**spruce grouse, black-backed woodpecker**, Blackburnian warbler*, pine warbler*, eastern wood pewee*, red-breasted nuthatch*, scarlet tanager*, brown creeper*, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Mature/Old

Currently, the amount of mature/old upland jack pine forest on the Chippewa is slightly below the lower limit of the amount expected under RNV. On the Superior, the amount of mature/old upland jack pine is more than twice the amount expected under RNV. Mature/old upland jack pine forest accounts for approximately 2.0% of all upland forest acres on the Chippewa and 11.0% on the Superior.

The existing amount of mature/old upland jack pine forest on the Superior includes approximately 129,500 acres of mature/old upland jack pine located within the BWCAW. This jack pine inside the BWCAW is almost two and one half times the amount currently located outside the BWCAW. By the end of decade 10, the amount of mature/old upland jack pine within the BWCAW drops to approximately 45,400 acres (nearly one third of existing levels). Without disturbance, particularly disturbance by fire, this forest type converts to spruce/fir.

RNV on the Superior is based on all National Forest land inside and outside the wilderness. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 9 – Lowland Black Spruce-Tamarack Forest habitat acres and percent in Young and Mature/Old

Indicator 9 measures acres and percent of lowland black spruce-tamarack-dominated forest types in young and mature/old. This indicator allows evaluation of species of management concern associated with habitat features of black spruce-tamarack-dominated forest types.

Indicator 9 excludes lowland white cedar even though it provides important habitat for some species of management concern because there are no differences projected in acres and percent among the alternatives.

Table WLD-9a: **MIH 9 – Young lowland black spruce/tamarack forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Heather vole	**Olive-sided flycatcher*,** golden-winged warbler*, palm warbler*, dark-eyed junco*, western Jacob's-ladder

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Currently, the amount of young lowland black spruce/tamarack forest on the Chippewa represents approximately 4.1% of all lowland forest on the Chippewa, approximately 40% below the lower limit of the amount expected under RNV. On the Superior, the amount of young lowland black spruce/tamarack forest currently represents approximately 4.9% of all lowland forest on the Superior, falling within the lower limits of the amount expected under RNV.

The existing amount of young lowland black spruce/tamarack forest on the Superior includes approximately 6,700 acres of young lowland black spruce/tamarack within the BWCAW. By the end of decade 2, the amount of young lowland black spruce/tamarack within the BWCAW drops to approximately 1,400 acres.

RNV on the Superior is based on all National Forest land inside and outside the BWCAW. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Mature/Old

Currently, the amount of mature/old lowland black spruce/tamarack forest on the Chippewa is slightly above the amount expected under RNV. On the Superior, the amount of mature/old lowland black spruce/tamarack falls within but very close to the upper limit of the amount expected under RNV. Mature/old lowland black spruce/tamarack forest accounts for approximately 87.8% of all lowland forest acres on the Chippewa and 79.4% on the Superior.

The existing amount of mature/old lowland black spruce/tamarack forest on the Superior within the

BWCAW remains fairly constant, rising only 6.5% from existing levels by decade 10.

Table WLD-9b: **MIH 9 – Mature/old lowland black spruce / tamarack forest, associated wildlife species of concern. ‡**

Superior	Chippewa
Boreal owl, Connecticut warbler, great gray owl, RFSS plants, spruce grouse, black-backed woodpecker, boreal chickadee, palm warbler*, yellow-bellied flycatcher*, Lincoln's sparrow*, ruby-crowned kinglet*, blue-headed vireo*, golden-crowned kinglet*, gray jay*	**Northern bog lemming, four-toed salamander, spruce grouse, black-backed woodpecker, great gray owl, Connecticut warbler*, olive-sided flycatcher*, RFSS plants,** boreal chickadee, palm warbler*, yellow-bellied flycatcher*, Lincoln's sparrow*, winter wren*, great crested flycatcher*, parula warbler*, gray jay*, golden-crowned kinglet*, blue-headed vireo*

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

RNV on the Superior is based on all National Forest land inside and outside the BWCAW. All acreages and percentages described for the Superior include lands both inside and outside the BWCAW.

Indicator 10 – Upland Young and Mature/Old Riparian Forest habitat acres and percent

Indicator 10 measures acres and percent of upland riparian forest types in young and mature/old within 100 (inner) and 200 (outer) feet of lakes and streams. This indicator allows evaluation of species of concern associated with habitat features of riparian forest.

Non-forested wetlands riparian habitat is excluded from this indicator even though it provides important habitat because there are no differences projected in acres and percent among the alternatives.

Table WLD-10: MIH 10 – Upland riparian forest, associated wildlife species of concern (Mature/old) ‡

Superior	Chippewa
Bald eagle, olive-sided flycatcher, wood turtle, RFSS fish and mollusks, northern waterthrush*, beaver, common merganser, hooded merganser, osprey, great blue heron, green frog, wood frog, white pine	**Bald eagle, olive-sided flycatcher*, RFSS fish and mollusks,** northern waterthrush*, beaver, common merganser, hooded merganser, osprey, great blue heron, green frog, wood frog, white pine

‡ Source: Planning record:
Bold - threatened, endangered or sensitive
* identified as indicator of bird biodiversity and forest ecosystem sustainability through Forest Birds of Western Great Lakes monitoring and modeling program. See Appendix D, Table DEIS-8 and (http://www.nrri.umn.edu/mnbirds/)

Young

Currently, the amount of young riparian forest on the Chippewa represents approximately 2.7% (inner) and 0.9% (outer) of all upland riparian forest. On the Superior, the existing amount of young riparian forest represents approximately 5.3% (inner) and 7.6% (outer) of all upland riparian forest on the Superior.

The analysis of MIH 10 on the Superior does not include the BWCAW.

Mature/Old

Currently, the amount of mature/old upland riparian forest on the Chippewa accounts for approximately 33.1% (inner) and 37.9% (outer) of all upland riparian forest acres on the Chippewa and 30.2% (inner) and 37.9% (outer) on the Superior.

3.3.1.b Environmental Consequences for Management Indicator Habitats 1-10

General Effects Common to All Alternatives

All alternatives have a variety of management activities and natural ecological processes in common that result in similar and predictable general effects to wildlife habitat or species: they alter habitat. The difference in effects depends on the amount, distribution, and frequency of these activities and processes in each alternative. In addition, the impact of change in habitats differs for each of the associated individual species. Impacts are either beneficial or negative depending on the life history and requirements of any given species.

Boundary Waters Canoe Area Wilderness (BWCAW)

The current and predicted habitat conditions in the BWCAW are disclosed in detail in the BWCAW Fuel Treatment Final EIS (USDA Forest Service 2001a). The Final EIS predicts a long-term trend in upland forests of increased area of mature/multi-aged spruce/fir forest, with a corresponding decrease in early successional species such as aspen-birch and jack pine. Red and white pine forests may recover somewhat but will remain well below the range of natural variability. Lowland conifer forests will increase in age. Because of the uncertainty over whether or when a major fire or windstorm could occur, the Final EIS acknowledges predicted trends could change.

General effects relevant to MIH 1-9 resulting from management of the BWCAW are not expected to differ by alternative. However, the conditions in the BWCAW do affect wildlife on the Superior and are considered in calculating the quantity of habitat and range of natural variability. Calculations for MIH 10 do not include upland riparian forest inside the BWCAW.

The following general effects vary by alternative:

Vegetation Management

Vegetation management can have a very wide range of effects on wildlife and its habitat conditions and these vary by MIH type or age, site, Landscape Ecosystem, timing, duration, intensity, type of management activity (Hunter 1990, Kohm and Franklin 1997, USDA Forest Service 1996b, 1997e, 2002d, planning record). Because of the very high complexity of environmental effects possible, this section identifies key effects to MIHs 1-10 associated with the following proposed and probable vegetation management activities:

Timber harvest:

Even-aged regeneration (including clearcutting)
Uneven aged management

Forest regeneration:

Natural regeneration
Mechanical Site Preparation
Conifer planting to restore within-stand diversity
Conifer planting to restore conifer forest types

Natural processes:

Vegetation succession
Insects and disease in forests
Nutrient cycling
Wildfire
Blowdown

Prescribed fire for:

Ecological objectives
Hazardous fuels reduction
Site preparation in clearcuts and shelterwoods

Timber Harvest and Prescribed Fire

Direct Effects

- May reduce amount of mature/old forest.
- May kill, harm, displace, or temporarily disturb some species represented by MIH 1-10, depending on seasonal timing of the activity.
- May destroy wildlife sites for rare species that are not readily reestablished elsewhere because of dispersal, rarity, or other limiting factors.
- May create wildlife sites for rare species.

These direct effects are expected to be localized and relatively short-term (1-5 years) in the sense that populations are adapted to absorbing mortality and may not necessarily be negatively affected. The effect may, however, be long-term (>5 years) if wildlife sites are not re-established. Management direction for all alternatives will be established to prevent or mitigate harm, mortality, or destruction of rare species and key habitats. Therefore, direct effects from timber harvest or prescribed fire are expected to be within an acceptable limit under all alternatives.

Indirect Effects

- Alters vegetation components at both landscape and site levels that comprise composition, structure, density, size, quantity, and distribution of habitat for forest-dependent species.
- May promote: maintenance of forest composition in some forest types; increase of within-stand diversity in other types; and stand development in mature/old forest (thinning, uneven-aged management, and/or underburning – low-intensity prescribed fire).
- Alters ecosystem processes on the site, such as nutrient cycling, mychorrhizal (fungal) associations, habitat connectivity, and soil fertility.
- Reduces, in most cases, amount of large trees, canopy cover, dead and dying trees, and may simplify stand structure.
- May create more young forest while removing mature/old forest (if fire is stand-replacing).
- Usually increases sunlight to forest floor and promotes renewal of forest and other changes to wildlife habitat (positive and negative).
- May provide an abundance of or decrease in amount of coarse woody debris.
- Alters animal communities and wildlife diversity. May result in altered interactions among species and vegetation communities such as competition, predation, dispersal, colonization, or herbivory.
- May fragment forest habitats or promote reduction of fragmentation through creation of large blocks of young forest.
- May temporarily or permanently increase human access to areas where human access might result in altered habitats, direct mortality, create corridors for predators or vectors for invasive non-native weeds, or cause other disturbance.

Indirect effects are expected to be greater over time than direct effects.

Changes to habitat through clearcutting, shelterwood, or partial cut harvest from mature/old to young are expected to be long-term: regrowth to mature conditions similar to those prior to harvest usually would take a minimum of 40 to 60 years depending on the MIH. Some important features of mature/old forest such as the amount of very large trees, coarse wood debris and large dead and dying trees, or the similar structural diversity of various canopy layers may not be re-established for a minimum of 60 to 120 years.

In some types of partial cut, the age of the forest is not set back to young, and therefore the forest patch is still considered mature or older. The conditions of partial cut forest usually provide different habitat conditions from unharvested mature forest. Partial cuts, as is usually the intention when using this prescription,

alter structural diversity to promote multi-aged, more structurally and compositionally complex forest as cut portions reforest.

Clearcuts may retain a high amount of coarse woody debris after harvest and it is only the opportunity for new additions of coarse woody debris that is a long-term effect.

Management direction for all alternatives establishes objectives for mature/old in amounts expected to be at least adequate to maintain species viability, therefore loss of stands of mature/old forest should be within acceptable limits. In addition, management direction mitigates the loss of some features of mature/old forest by promoting management that mimics natural disturbance and includes retention of large trees, wildlife and seed trees, snags, and coarse woody debris.

Effects of establishment of young forest habitat through the clearcutting, shelterwood, and partial cut harvest are expected to be short-term: rapid growth of most forest types generally alters young habitat for many associated species within ten years on upland sites and within 20 years on lowland sites. Management direction for all alternatives establishes objectives for young forest in amounts expected to be at least adequate to maintain species viability, therefore changes in location and acres of young forest should be within acceptable limits.

Indirect effects associated with human access to habitats may be either long-term or short-term. Management for all alternatives directs closure of temporary logging roads, therefore most impacts would be expected to be short-term (3-7 years). Longer termed effects (>10 years) may result if roads are open to recreational motor vehicle or other trail use. Management standards for all alternatives would mitigate potential long-term negative impacts by requiring that environmental concerns be met.

Forest regeneration

Direct Effects

- May kill, harm, displace, or temporarily disturb some species represented by MIH 1-10, depending on seasonal timing of the activity (site preparation).
- May destroy wildlife sites for rare species that are not readily reestablished elsewhere because of dispersal, rarity, or other limiting factors.
- May create wildlife sites for rare species.
- May change habitat from one MIH to another, natural regeneration may favor aspen/birch (MIH-4) and spruce-fir (MIH-6), as opposed to jack pine (MIH-8), red and white pine (MIH-7).
- Site preparation and planting or seeding may assist in restoration of conifer species thereby increasing MIH –6, 7, & 8 in former hardwood stands.

As with the direct effects of timber harvest and prescribed fire, the direct effects of forest regeneration are expected to be localized and relatively short-term (1-5 years) in the sense that populations are adapted to absorbing mortality and may not necessarily be negatively affected. The effect may, however, be long-term (>5 years) if wildlife sites are not re-established. Management direction for all alternatives will be established to prevent or mitigate harm, mortality, or destruction of rare species and key habitats. Therefore, direct effects from forest regeneration are expected to be within an acceptable limit under all alternatives.

Indirect Effects

Wildlife species associated with each MIH may change because of regeneration-induced changes in MIH.
May create longer-term openings or decrease the representation of black spruce, tamarack, and white cedar on the Chippewa and white cedar on the Superior where there have been problems with lowland conifer regeneration.

Vegetation Succession and Fire Exclusion

Direct and Indirect Effects

- Gradually results in development of environmental conditions associated with

mature, old, and multi-aged old growth forests such as large trees, abundant dead and dying trees, and diverse stand structure due to multiple layers of vegetation.
- Increases the likelihood of natural disturbance factors of insect and disease, more intense wildfire and blowdown.
- Will likely result in changes in MIH from short-lived species (aspen, birch, balsam fir) to longer lived species (red and white pine, white spruce).
- Aspen, birch and balsam fir mortality during successional stages could result in upland brush openings for a period of years.
- In some forest types, such as the pines, if succession is not interrupted by stand replacement or low intensity disturbances, pine seed source may be lost from the site for decades or more (Frelich 1999). Other impacts are described in Chapter 3.5 Role of Fire.

Direct and Indirect Effects for MIHs 1-10

As described above, the direct effects of alternatives on MIHs 1-10 are primarily from vegetation management – whether the result of human activities and influences or the result of natural disturbances and processes. These can alter habitats suddenly or gradually over time, providing new habitat and benefits for some species while displacing and negatively affecting others.

Dualplan was used to predict the acres of indicators by alternative outside of the BWCAW. Natural disturbances were not predicted by Dualplan, therefore the changes to MIHs modeled under each alternative result from human management activities and succession. An exception is the BWCAW where some natural disturbance was modeled. Predictions of natural disturbances within the BWCAW for each indicator are from the Fire Effects Tradeoff Model (USDA Forest Service 2001a). Although the effects on each MIH within the BWCAW vary by MIH, they are identical for each alternative.

A non-spatial analysis of the range of natural variability at the forest-wide scale was used as a tool to help make relative comparisons of the alternatives for each MIH. However, the evaluations of MIHs 1-10 address habitat quantity only. The other wildlife indicators consider the impact of estimated vegetation patterns and distributions, which are key factors in determining habitat quality and the ability of the Forests to provide well-distributed habitat and maintain species viability.

Figures WLD 1a – 10b display the acres of each of the 10 Forest type / age group Management Indicator Habitats by alternative for decades 2 and 10 in bar graph form. In addition, both the high and low ends of the range of natural variability are provided for comparison. Between the written descriptions of effects and the bar graphs (Figures WLD 1a – WLD 10b) and tables in Appendix D, the graphs and tables more clearly display the effects of the alternatives on each MIH.

Young Forest

Alternatives A and C

With only a couple of exceptions, Alternatives A and C generally increase the representation of younger age classes in both the short and long term and would provide highly favorable habitat conditions for species associated with young forest on both the Chippewa and Superior National Forests. Dualplan demonstrated that Alternatives A and C would provide an abundant amount of young forest in 9 of the first 10 MIHs in decade 2 on both forests.

Though establishment of young forest habitat is a short-term effect (10 years for upland and 20 years for lowland forests), timber harvest generally would continually re-establish new young forest. The amount available would vary in each decade.

Effects on Chippewa – Alternatives A and C
On the Chippewa, either Alternative A or C would provide abundant amounts of young forest for 9 of the first 10 MIH in decades 2 and 10.

In young jack pine, however, Alternatives A and C would provide relatively low amounts of young forest in decade 2 with only moderate amounts of young forest by decade 10. This might be explained by the fact that although Alternatives A and C emphasize early successional species, their emphasis on providing deer/moose habitat or replicating large-scale natural disturbances through timber harvest with limited use of fire tends to favor aspen/birch and other upland conifer types but disfavors jack pine. This also reflects greater amounts of jack pine restoration in other alternatives.

With few exceptions, the amount of young forest habitat produced under Alternatives A and C would be well above the amounts expected under the range of natural variability (RNV). Only MIH 5 (all upland conifer) and MIH 7 (red and white pine) would have amounts of young forest created under both Alternatives A or C that would fall within or only slightly above the limits expected under RNV.

Assuming a direct correlation between habitat availability and species populations, overall conditions in young MIH 5 and MIH 7 forests would generally result in population levels close to those expected under the range of natural variability on National Forest land.

The amount of young MIH 1 (upland forest), MIH 2 (upland deciduous) and MIH 4 (aspen/birch) that could be created under either Alternatives A or C would provide more than three times the amount expected under RNV in both decades 2 and 10. Although this is high, it is very close to current levels of MIHs 1, 2, and 4.In addition, under Alternative C, the amount of young MIH 3 (upland northern hardwood) would range from six and one half to twelve times the amount expected under RNV. (The amount of young MIH 3 that would be produced under Alternative A would be within (decade 2) or only slightly above (decade 10) the amount expected under RNV.)

Assuming a direct correlation between habitat availability and species populations, conditions in the upland deciduous-dominated MIHs 1-4, would promote associated species at well above their populations' range of natural variability on National Forest land. At the highest levels, some of the favored species of the upland young deciduous forest habitats - such as deer - could have substantial negative impacts on biological diversity.

Similarly, in Decade 2 of Alternatives A and C, the amount of young MIH 6 (spruce-fir Forest) would be almost two (Alternative C) to three (Alternative A) times the amount expected under the range of natural variability. This could be a result of harvesting the "bulge" in older age classes that would be present within the next two decades. By decade 10, the amount of young MIH 6 in Alternatives A and C would decrease to levels within the amount expected under RNV.

Currently, the amount of young jack pine is approximately 9% below the amount expected under RNV. Young jack pine forest (MIH 8) for Alternatives A and C in all decades would be further below the range of natural variability. In decade 2, the amount of young jack pine would be 84% (Alternative A) to 57% (Alternative C) below the amount expected under RNV. However, by decade 10, the amount of young jack pine forest in Alternatives A and C would rise to be about 15% below the amount expected under RNV. This overall decrease in young jack pine forests from the range of natural variability could be caused by these alternatives' emphasis on providing deer/moose habitat, fire suppression, or the restricted use of fire as a tool to mimic natural disturbances. The reduction of this young forest MIH could negatively affect its associated species. However, because the wildlife species associated with this MIH are also associated with at least one other young MIH, the effects may not be severe.

The amount of young lowland black spruce (MIH 9) that could be created under either Alternatives A or C would be two and one half (Alternative A) to three (Alternative C) times the amount expected under RNV in decade 2. However, by decade 10 the amount of young lowland black spruce would drop to 57% below the amount expected under RNV in Alternative A. In Alternative C, the amount of young lowland black spruce at decade 10 would be 30% higher than the amount expected under RNV.

Currently the amount of young MIH 9 is approximately 43% below RNV. The effects of either Alternatives A or C could set up a "boom / bust situation for species populations associated with this MIH.

Finally, Alternatives A and C would provide approximately 800 (Alternative A) to 1200 (Alternative C) acres of young forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) in both decades 2 and 10. They would produce approximately 1600 to 1700 acres in the outer zone (100 – 200') of MIH 10 in decade 2, decreasing to approximately 1300 acres in decade 10. Overall, however, the amount of young MIH 10 would increase approximately 23 to 43% under Alternative A and 26 to 47% under Alternative C.

Under this alternative, both the inner and outer zones of MIH 10 were modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model.

Effects on Superior -Alternatives A and C

Starting as early as decade 1, the existing large amount of young forest in the BWCAW associated with the 1999 windstorm will grow out of the young forest category. In the upland forest category (MIH 1) the amount of young forest will drop 92% in the BWCAW by decade 2, moderating the impact of relatively high amounts of young forest in almost all upland MIHs outside the Wilderness.

Alternatives A and C were both designed to produce high levels of early successional forest, however Alternative A's emphasis would be on providing deer/moose habitat (a continuation of the 1986 Forest Plan) in the form of young aspen/birch forest (MIH 4 – also MIH 2 upland deciduous).

The amount of young MIH 2 (upland deciduous) or MIH 4 (aspen/birch) forests that could be created under either Alternatives A or C would provide 22% to 29% more than the amounts that would be expected for these MIHs under RNV in decade 2 and 11 to 18% more than the amounts expected under RNV by decade 10 (currently, both of these MIHs are present at levels within their expected ranges of natural variability). Although these amounts are greater than the amounts expected under RNV, they are not as extreme as the amounts that would occur under Alternatives A and C on the Chippewa.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 2 and MIH 4, would result in population levels somewhat above their range of natural variability on National Forest land. At extremely high levels, some of the favored species of the upland young deciduous forest habitats - such as deer - could have substantial negative impacts on biological diversity (Biological Evaluation for Plants, 2004e, USDA Forest Service 2002c, and Chapter 3.3.6.4).

Currently, the existing amount of MIH 3 (upland northern hardwood) is within its expected range of natural variability. MIH 3 would remain within its expected RNV in both decades 2 and 10 of Alternative A. However, under Alternative C, the amount of young MIH 3 would increase to levels approximately 45% above RNV by decade 2, decreasing to levels within its expected RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 3 would result in population levels pretty much within their expected range of natural variability.

The amount of young MIH 5 (upland conifer) that would be produced under Alternatives A and C would be approximately 73% (Alternative C) to 84% (Alternative A) below currently existing levels in decade 2. However, because the currently existing amount of MIH 5 is approximately 69% above RNV, these decreases expected under Alternatives A and C would bring the level of MIH 5 down to within or only slightly below levels expected under RNV. The amount of young MIH 5 would increase only slightly by decade 10 to be at levels approximately 7% (Alternative A) to 12% (Alternative C) above RNV. Although there would be a large decrease from existing levels of MIH 5 to decade 2 levels, conditions

in MIH 5 would result in associated species population levels close to the amounts expected under RNV.

The amount of young MIH 6 (upland spruce/fir) forest that would be produced under Alternatives A and C would show an even higher disparity with its expected RNV than MIH 2 and MIH 4. Alternatives A and C would produce two and one-third (Alternative A) to five (Alternative C) times the amount of young upland spruce/fir forest in decade 2 than the amount expected under RNV. By decade 10, the amount of young upland spruce/fir forest would increase in Alternative A to nearly five times the amount expected under RNV and decrease in Alternative C to slightly less than four times the amount expected under RNV. However, despite these high levels of young upland spruce/fir, these amounts are considerably less (4 to 9 times less) than the amount of young MIH 6 that currently exists.

Assuming a direct correlation between habitat availability and species populations, conditions in young MIH 6, would result in population levels well above the population range of natural variability on National Forest land, however by decade 2, these levels of young upland spruce fir would be a fraction of the amount that currently exists. The immediate reduction of young forest in MIH 6 could negatively affect species associated with young upland spruce/fir. However, because current levels of young MIH 6 are almost twenty times higher than the amount expected under RNV, the decrease could be beneficial to these species in the long term. In addition, because the wildlife species associated with this MIH are also associated with at least one other young MIH, the effects may not be severe.

Currently, the existing amount of young MIH 7 (red and white pine) is approximately 71% above its expected RNV. However, the amount of young MIH 7 would be approximately 35% (Alternative C) to 58% (Alternative A) below than the amount expected under RNV in decade 2 but approximately 43% higher than the amounts expected under RNV in decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in young MIH 7, the effects of either Alternatives A or C could set up a “boom / bust” situation for these species, resulting in population levels below the range of natural variability (and well below current population levels) on National Forest land in the early decades and above the range of natural variability in the later decades.

Young jack pine forest (MIH 8) for Alternative A in decades 2 and 10 and for Alternative C in decade 2, would be below the range of natural variability. In decade 2 the amount of young jack pine would be 34 to 40% below the amount expected under RNV. As the amount of young MIH 8 forest that would be produced in Alternatives A and C would be equal to or slightly higher than existing levels outside of the BWCAW, this drop would be caused by the large decrease in young jack pine forests that will occur inside the BWCAW by decade 2. By decade 10, the amount of young jack pine forest in Alternative A would be approximately 45% below the amount expected under RNV but within RNV under Alternative C.

The amount of young lowland black spruce (MIH 9) that could be created under Alternative A would be approximately 21% more than the amount expected under RNV in decade 2. In Alternative C, the amount of young MIH 9 would be approximately 67% (three times) more than the amount expected under RNV. However, by decade 10 the amount of young lowland black spruce would drop to 59% below the amount expected under RNV in Alternative A. In Alternative C, the amount of young lowland black spruce at decade 10 would be within the amount expected under RNV.

Finally, Alternatives A and C would provide approximately 1300 (Alternative A) to 3000 (Alternative C) acres of young forest in the inner zone (0 – 100’) of MIH 10 (upland riparian forest) and approximately 3900 to 4900 acres in the outer zone (100-200’) of MIH 10 in decade 2. In decade 10, Alternatives A and C would provide approximately 2000 acres of young forest in the inner zone (0 – 100’) of MIH 10 (upland riparian forest) and approximately 5000 to 4500 acres in the outer zone (100-200’) of MIH 10. Overall, this represents a decrease in levels of MIH 10 of approximately 20 to 66% in the inner zone

and 5 to 28% in the outer zone from currently existing levels.

Under this alternative, both the inner and outer zones of MIH 10 were modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model.

Alternatives B and D

With a few exceptions, Alternatives B and D would provide generally unfavorable habitat conditions for species associated with young forest on both the Chippewa and Superior National Forests. Dualplan demonstrated that overall, either Alternative B or D would provide the least amount of young forest. However, with two possible exceptions on the Chippewa (MIH 7 and 9), these alternatives would provide at least adequate representation of habitat amounts to maintain viable populations of species.

Though young forest habitat is a short-term effect, timber harvest would continually supply new young forest in most of the MIHs. In Alternative B, the amount of young forest in each MIH among all decades would differ by less than 2%. These differences between decades would be much larger in Alternative D. During decades 1 and 2, Alternative D would establish a greater amount of young habitat than Alternative B. By decade 10, young forest levels in Alternative D would drop to almost half the amount expected in Alternative B.

Effects on Chippewa – Alternatives B and D

Although Alternatives B and D would generally produce lower amounts of young forest, these levels generally would be at or just below the lower level of RNV. There are a few instances where this is not the case. In decade 10, Alternative D would produce young forest levels in MIHs 1 (upland forest), 2 (upland deciduous), 4 (aspen / birch) and 5 (upland conifer) that would be almost 50% lower than the amounts expected under RNV. In addition, Alternative D would produce no young red or white pine (MIH 7) in decade 10 or lowland black spruce (MIH 9) in either decade 2 or 10. It should be noted, however, that natural disturbances (not modeled by Dualplan) and increased emphasis on prescribed fire would be expected to contribute to young forest in these alternatives.

On the Chippewa the conditions for Alternative B in all decades would be within to approximately 22% below the estimated lower range of natural variability. By decade 10, the amount of young forest in all MIHs would be within the lower limit of the amount expected under RNV.

Assuming a direct correlation between habitat availability and species populations, these conditions would generally result in population levels at the lower end of the range of natural variability on National Forest land. Even in decade 2, Alternative B would provide adequate representation of habitat amounts to maintain viable species.

Like Alternative B, the conditions of young forest under Alternative D in decade 2 would be within to 19% below the estimated range of natural variability in all but one MIH (MIH 9 – lowland black spruce). However, although the amount of young forest would gradually increase to within the lower limits of RNV by decade 10 in Alternative B, in Alternative D the amount of young forest would drop well below (35-100%) the estimated range of natural variability by decade 10. Dualplan indicates that there would be no young northern hardwoods (MIH 3) and no young lowland black spruce/ (MIH 9) at decades 2 or 10 and no young red and white pine (MIH 7) by decade 10. The low end of the estimated RNV for young northern hardwoods is zero, so although there would be no young northern hardwood habitat, it would be within the lower limits of the amount expected under RNV. However, the low end of the estimated RNV for young lowland black spruce is approximately 4,500 acres and 2,000 acres for young red and white pine. The loss of these two young forest MIHs could negatively affect their associated species. However, because the wildlife species associated with these two young MIHs are also associated with at least one other young MIH, the effects may not be severe. It should also be noted, that natural disturbances (not modeled by Dualplan) and increased emphasis on prescribed fire would be

expected to contribute to young forest in these alternatives.

For MIH 10 (riparian upland), Alternatives B and D would provide zero acres of young forest in the inner zone (0 – 100') in both decades 2 and 10. In the outer zone (100 – 200') they would produce approximately 230 to 300 (Alternative B decades 2 and 10) and 270 to 630 (Alternative D decades 2 and 10) acres of young forest.

Under this alternative, only the outer zone of MIH 10 was modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model. The inner zone was modeled as not suitable for timber production.

In addition, it should be restated that Dualplan considers only human management activities that could occur in each alternative, not natural disturbances from wind, fire, or insects and disease.

Effects on Superior- Alternatives B and D

Alternatives B and D would produce the lowest amount of young forest in MIHs 1 (upland forest), 2 (upland deciduous), 3, (northern hardwood), and 4 (aspen / birch) in decades 2 and 10 In fact, these alternatives would produce no young forest at all in MIH 3 (northern hardwoods) in either decade 2 or 10. It should be noted, however, that natural disturbances (not modeled by Dualplan) and increased emphasis on prescribed fire would be expected to contribute to young forest in these alternatives.

Although Alternatives B and D would generally produce very low amounts of young, there are a couple of specific instances where this would not be the case. The amount of young forest in MIH 8 (jack pine) in decade 2 of Alternative D and in decade 10 of both Alternatives B and D would actually be at moderate levels, falling within the lower limits of RNV. In decade 2, Alternative D would produce the relatively high amounts of young MIH 5 (upland conifer) and relatively very high amounts of young MIH 8 (jack pine). This is likely the result of Alternative D's emphasis on restoring jack pine to amounts closer to its RNV.

On the Superior, the influence of the expected growth of forest from young age into sapling/pole stage in the BWCAW by the first decade would immediately amplify the impact of relatively low amounts of young forest created in the future by management actions outside the Wilderness. It should be reiterated that Dualplan was used to model the effects of all the alternatives outside of the BWCAW. Dualplan considers management activities that could occur in each alternative, but it does not consider natural disturbances from wind, fire, or insects and disease. Natural disturbances would also affect forest conditions in all the alternatives on both forests and likely contribute to young forest. In addition, increased emphasis on prescribed fire would also be expected to contribute to young forest in these alternatives.

With four exceptions, the conditions for Alternative B in decade 2 would be within the lower range or slightly below the estimated lower range of natural variability. However, in MIH 5 (upland conifer), MIH 7 (red and white pine), and MIH 8 the amount of young forest that would be produced in decade 2 would be approximately 39% (MIH 5), 80% (MIH 7), and 71% (MIH 8) below the amount expected under RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 5 (upland conifer), MIH 7 (red and white pine) and MIH 8 (jack pine) would result in population levels of associated species well below the range of natural variability on National Forest land. This could negatively affect the species associated with these MIHs. However, as with all the other MIHs in Alternative B, the amount of young forest in MIHs 5, 7, and 8 would increase to within levels expected under RNV by decade 10.

The fourth exception would be young upland spruce/fir (MIH 6). Unlike the other MIHs, the amount of young forest in MIH 6 in decade 2 would be approximately 41% higher than the amount expected under RNV in Alternative B. However, it would be almost twelve times lower than the amount of young

spruce/fir that currently exists. The immediate reduction of young forest in MIH 6 could negatively affect species associated with young spruce/fir forests. However, because current levels of young MIH 6 are so much above the amount expected under RNV (95% above), the decrease could be beneficial to these species in the long term. As with the other MIHs, under Alternative B MIH 6 will fall within levels expected under RNV by decade 10.

Dualplan indicates that there would be no young northern hardwoods (MIH 3) in Alternative B or D at decades 2 or 10. The low end of the estimated RNV for young northern hardwoods is zero, so although there would be no young northern hardwood habitat, it would be within the lower limits of the amount expected under RNV and would not be expected to have any ill effects on associated species.

Under Alternative B, the amount of young forest in all MIHs would be at the lower limit of the amount expected under RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, these conditions would generally result in population levels at the lower end of the range of natural variability on National Forest land.

Like Alternative B, the conditions of young forest under Alternative D in decade 2 would be within the lower range or slightly below the estimated range of natural variability in 4 of the MIHs. However, although the amount of young forest would gradually increase to within the lower limits of RNV by decade 10 in Alternative B, in Alternative D the amount of young forest would decrease further below (6-88%) the estimated range of natural variability by decade 10.

The amount of young MIH 2 (upland deciduous) or MIH 4 (aspen/birch) forests that would be produced under Alternative D in decade 2 would be 43% lower than the amounts that would be expected for these MIHs under RNV. By decade 10, the amount of young forest in MIH 2 and MIH 4 would decrease to be approximately 82% below the amount expected under RNV.

Similarly, the amount of young MIH 7 (red and white pine) forest under Alternative D would be approximately 54% below the amount expected under RNV in decade 2, decreasing to almost 80% below the amount expected under RNV in decade 10. In fact, according to Dualplan, there would be no young MIH 7 outside of the BWCAW. However keep in mind that Dualplan considers only human management activities that could occur in each alternative, not natural disturbances from wind, fire, or insects and disease.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 2, MIH 4, and MIH 7 would result in population levels well below the range of natural variability on National Forest land. At the lowest levels, some of the favored species of the upland young deciduous and young red and white pine forest habitats could be affected in the long term. However, because the wildlife species associated with these three MIHs are also associated with at least one other young MIH, the effects may not be severe.

The effects of Alternative D on young MIH 9 (lowland black spruce) would be completely dissimilar from those of Alternative B. Under Alternative B the amount of young lowland black spruce produced would be within the amounts expected under RNV for both decades 2 and 10. However, in Alternative D, the amount of young MIH 9 would be 88% below the levels expected under RNV in both decades 2 and 10.

Because of the natural disturbance predicted within the BWCAW by the Fire Effects Tradeoff Model, MIHs 7 and 9 would drop to 80% (MIH 7) and 88% (MIH 9) below their expected RNV in Alternative D on the Superior, not 100% as on the Chippewa. However, like the Chippewa, under Alternative D there would be no young MIH 7 in decade 10 or young MIH 9 in decades 2 or 10 outside of the BWCAW, and no young MIH 3 inside or outside of the BWCAW.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 7 and MIH 9 would result in population levels well below the range of natural variability on National Forest land. The loss of these two young forest MIHs could negatively affect their associated species.

However, because the wildlife species associated with these two MIHs are also associated with at least one other young MIH, the effects may not be severe.

Currently, the existing amount of young forest in the inner zone of MIH 10 is approximately 3725 acres with approximately 5331 acres in the outer zone. For MIH 10 (riparian upland), Alternatives B and D would provide zero acres of young forest in the inner zone (0 – 100') in both decades 2 and 10. In the outer zone (100 – 200') they would produce approximately 640 to 760 (Alternative B decades 2 and 10) and 1500 to 550 (Alternative D decades 2 and 10) acres of young forest.

Under this alternative, only the outer zone of MIH 10 was modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model. The inner zone was modeled as not suitable for timber production.

Alternatives Modified E, F, and G

Effects from Alternatives Modified E, F, and G generally are considered to be moderate and very similar to each other. However, because there are some important differences between them, they will be discussed separately in order to better illustrate these important differences and reduce the complexity of describing these alternatives in one all-encompassing analysis.

Modified Alternative E

Modified Alternative E on both Forests would generally benefit associated species in all 10 MIH, because with one or two exceptions it would provide relatively high amounts of young upland forest in all decades. The amount of young forest within each MIH is generally within the amounts expected under the range of natural variability; but in decades or MIHs where amount of habitat is less than RNV, there would still be adequate habitat for wildlife species associated with that habitat.

Modified Alternative E works toward forest age and composition objectives determined by Landscape Ecosystems and places a greater emphasis on conifer restoration. Fire would be used as a tool for reinstating ecological processes on a small spatial scale.

Though young forest habitat is a short-term effect (10 years for upland and 20 years for lowland forests), timber harvest would continually supply new young forest.

Under this alternative, only the outer zone of MIH 10 was modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model. The inner zone was modeled as not suitable for timber production.

Effects on Chippewa Modified Alternative E

On the Chippewa, Modified Alternative E would provide levels of young forest habitat for MIHs 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir), and 7 (red and white pine) that fall within or only slightly above (MIH 7) their expected ranges of natural variation in both decades 2 and 10.

For young MIHs 1 (upland forest), 2 (upland deciduous), and 4 (aspen / birch) , the amount of young forest produced under Modified Alternative E at decade 2 would be 14% (MIH 1), 53% (MIH 2) and 56% (MIH 4) higher than the amounts expected under RNV. By decade 10, the amount of young forest in MIHs 1, 2, and 4 would decrease to levels 2% (MIH 1), 34% (MIH 2), and 40% above the levels expected under RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in young MIHs 1 (upland forest), 2 (upland deciduous) and 4 (upland aspen-birch), would result in population levels above the range of natural variability on National Forest land. However MIHs 2 and 4 would be approximately 40% (decade 2) to 56% (decade 10) lower than the amount of existing young upland deciduous and aspen/birch forest. Thus, associated

population levels would not be expected to come near levels that could substantially negatively affect wildlife diversity.

Modified Alternative E would provide levels of young MIHs 8 (jack pine) and 9 (lowland black spruce) that fall within (MIH 8) to approximately 4% above (MIH9) the range of natural variation in decade 2. However by decade 10, Dualplan projects that the amount of young forest in MIHs 8 and 9 would drop to levels approximately 22% (MIH 9) to 40% (MIH 8) below RNV. Modified Alternative E places a greater emphasis on jack pine restoration in the early decades because this alternative works toward forest age and composition objectives determined by Landscape Ecosystems. Current jack pine levels on the Chippewa (in both the young and mature/old age classes) are approximately 9% below the amounts expected under RNV. Fire would be used as a tool for reinstating ecological processes on a small spatial scale, facilitating jack pine restoration.

Assuming a direct correlation between habitat availability and species populations, these conditions would result in population levels closer to the range of natural variability for jack pine and lowland black spruce in decade 2, decreasing to below RNV levels by decade 10.

On the Chippewa, the effect of Modified Alternative E on MIH 10 (upland riparian forest) conditions is also noteworthy. MIH 10 is one of the 3 MIHs in decades 2 and 10 in which Modified Alternative E would produce lower levels of young forest (less than 1000 acres). One of the foci of this alternative is on protecting, enhancing, and restoring riparian areas because they are important to recreation and tourism (DEIS section 2.4.5). Modified Alternative E would produce virtually no young forest within the inner riparian zone (0-100') in decades 2 or 10. The amount of young forest Modified Alternative E would create in the outer riparian zone (100-200') would be approximately 950 acres in decade 2 and 990 acres in decade 10.

Effects on Superior- Modified Alternative E

Starting as early as decade 1 the existing large amount of young forest in the BWCAW associated with the 1999 windstorm will grow out of the young forest category. In the upland forest category (MIH 1) the amount of young forest will drop 92% in the BWCAW by decade 2, moderating the impact of relatively high amounts of young forest created in the future by management actions outside the Wilderness.

On the Superior, Modified Alternative E would provide a relatively high amount of young forest habitat in 9 of the 10 MIHs in decades 2 and 10. The amount of habitat produced for all MIHs except MIH 7 (at decade 10) would fall within the amounts predicted under RNV in both decades 2 and 10.
The amounts of young forest in MIHs 1, 2, and 4 (uplands, upland deciduous, and aspen/birch) that are important to deer and moose populations, would remain within the RNV. Thus the population level of these species would be healthy, and the population of deer would not be expected to come near levels that could substantially negatively affect wildlife diversity.
For MIH 7 (red / white pine), the amount of young forest produced under Modified Alternative E at decade 10 would be approximately 44% above the amount expected under RNV.
Assuming a direct correlation between habitat availability and species populations, conditions in young MIH 7 (red / white pine), would result in population levels of species associated with this MIH on the Superior NF to be above the range of natural variability on National Forest land.

As on the Chippewa, the effect of Modified Alternative E on MIH 10 (upland riparian forest) conditions on the Superior is also noteworthy. Currently, the existing amount of young forest in the inner zone of MIH 10 is approximately 3725 acres with approximately 5331 acres in the outer zone. Modified Alternative E would produce no young forest within the inner riparian zone (0-100') in decades 2 or 10. However, Modified Alternative E would produce approximately 2600 acres of young upland riparian forest in the outer riparian zone (100-200') in both decades 2 and 10.

Alternative F

Alternative F on both Forests would generally benefit associated species in all 10 MIH. The amount of young forest within each MIH is generally within the amounts expected under the range of natural variability, but in decades or MIHs where the amount of habitat falls below RNV, there would still be adequate habitat for wildlife species associated with that habitat.

Though young forest habitat is a short-term effect (10 years for upland and 20 years for lowland forests), timber harvest would continually supply new young forest.

Under this alternative, both the inner and outer zones of MIH 10 were modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model.

Effects on Chippewa- Alternative F

On the Chippewa, the effects of Alternative F would produce amounts of young forest habitat that would fall within the middle range of the amounts predicted under RNV for all MIHs by decade 10.

In decade 2, Alternative F would produce amounts of young forest that fall within or only slightly above (MIH 9 only) the RNV in six of the ten MIHs. These MIHs include MIHs 1 (upland forest), 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir), 7 (red and white pine), and 9 (lowland black spruce). However MIHs 2 (upland deciduous), 4 (aspen / birch), and 8 (jack pine) would be available at levels approximately 23 to 30% below the range of natural variability at decade 2.

Assuming a direct correlation between habitat availability and species populations, Alternative F would result in young forest population levels within the range of natural variability for six of the MIHs by decade 2 and for all MIHs by decade 10.
In addition, Alternative F would provide approximately 240 acres of young forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 540 acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Alternative F would provide approximately 240 acres of young forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 560 acres in the outer zone (100-200') of MIH 10. This would be a reduction of approximately 61% from currently existing levels in the inner zone and a reduction of approximately 42% from currently existing levels in the outer zone of MIH 10.

Effects on Superior - Alternative F

Starting as early as decade 1 the existing large amount of young forest in the BWCAW associated with the 1999 windstorm will grow out of the young forest category. In the upland forest category (MIH 1) the amount of young forest will drop 92% in the BWCAW by decade 2, moderating the impact of relatively high amounts of young forest created in the future by management actions outside the Wilderness.

On the Superior, Alternative F, by design, would move and maintain forest conditions closer to the middle range of the amounts expected under RNV. With three exceptions, the amount of habitat produced would fall within the amounts predicted under RNV in decades 2 and 10. However by decade 10 all MIHs would fall within the amounts expected under RNV.

The amount of young MIH 6 (upland spruce/fir) forest that would be produced under Alternative F in decade 2 would be two and one-half times the amount of young upland spruce/fir expected under RNV. However, despite this high level of young spruce/fir, these amounts are 8 times less than the currently existing amount of young spruce fir.

Assuming a direct correlation between habitat availability and species populations, conditions in young MIH 6, would result in population levels well above their population range of natural variability on National Forest land, however in decade 2, these levels of young spruce fir would be a fraction of the amount that currently exists. The immediate reduction of young forest in MIH 6 could negatively affect species associated with young spruce/fir forests. However, because current levels of young MIH 6 are almost twenty times higher than the amount expected under RNV, the decrease could be beneficial to these species in the long term. In addition, because the wildlife

species associated with this MIH are also associated with at least one other young MIH, the effects may not be severe.

Meanwhile for MIH 7 (red and white pine), the amount of young forest would be approximately 60% lower than the amount expected under RNV in decade 2. Similar to MIH 6, the amount of young red and white pine that would be available by decade 2 would be approximately 95% of the amount that currently exists. The immediate large reduction of young forest in MIH 7 could negatively affect species associated with young red and white pine forests. However, because current levels of young MIH 7 are approximately 3 and one half times (71%) higher than the amount expected under RNV, the effects of Alternative F could set up a "boom / bust" situation for the species associated with this MIH in the short term.

Alternative F would produce a relatively high amount of young MIH 8 (jack pine) in decade 2 and the largest amount of young jack pine in decade 10. However in decade 2, the amount of young MIH 8 would be 25% below the range of natural variability in decade 2 and only slightly below currently existing levels of young jack pine. Despite the fact that Alternative F would more than double the amount of young jack pine between decade 2 levels and decade 10, the amount of young jack pine would fall within the middle of the amount expected under RNV because of the decrease of young MIH 8 inside the BWCAW. Alternative F works toward forest age and composition objectives within the range of natural variability, and thus places a greater emphasis on conifer restoration. Fire would be used as a tool for reinstating ecological processes on a small spatial scale, facilitating jack pine restoration.

Assuming a direct correlation between habitat availability and species populations, at decades 2 and 10, Alternative F would result in population levels of species associated with young forest MIHs on the Superior at levels fairly close to the range of natural variability.

Finally, Alternative F would provide approximately 530 acres of young forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 2500 acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Alternative F would provide approximately 740 acres of young forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 3100 acres in the outer zone (100-200') of MIH 10. This would be a reduction of approximately 83% from currently existing levels in the inner zone and a reduction of approximately 42% (decade 10) to 52% (decade 2) from currently existing levels in the outer zone of MIH 10.

Alternative G

Alternative G on both Forests would generally benefit associated species in all 10 MIH, because with one or two exceptions it would provide a moderate amount of young upland forest in all decades. The amount of young forest within each MIH is generally within or just above or below the amount expected under the range of natural variability, but in decades or MIHs where amount of habitat is less than RNV, there would still be adequate habitat wildlife species associated with that habitat.

Though young forest habitat is a short-term effect (10 years for upland and 20 years for lowland forests), timber harvest would continually supply new young forest.

Under this alternative, only the outer zone of MIH 10 was modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model. The inner zone was modeled as not suitable for timber production.

Effects on Chippewa – Alternative G

On the Chippewa, Alternative G would provide amounts of young forest habitat that fall within or only slightly above the range of natural variation at both decades 2 and 10 for 5 of the MIHs. These MIHs include 1 (upland forest), 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir), and 7 (red and white pine).

Assuming a direct correlation between habitat availability and species populations, at decades 2 and 10, Alternative G would result in population levels of species associated with these five young forest MIHs on the Chippewa at levels fairly close to the range of natural variability.

Of the remaining MIHs, Alternative G would produce young forest slightly exceeding the expected RNV in both decades 2 and 10 in MIHs 2 (upland deciduous) and 4 (aspen / birch). MIH 2 would exceed RNV by approximately 10% in decade 2 and by 26% in decade 10. MIH 4 would exceed RNV by approximately 14% in decade 2 and by 31% in decade 10. Although these MIHs would exceed RNV,

Assuming a direct correlation between habitat availability and species populations, conditions in MIHs 2 (upland deciduous) and 4 (upland aspen-birch), would result in population levels of species associated with these young forests slightly above the range of natural variability on National Forest land. However, the amounts of MIH 2 and MIH 4 would be approximately 68% below currently existing levels. Thus population levels of associated species would not be expected to come near levels that could negatively affect wildlife diversity.

In decade 2, Alternative G would provide a high amount of young MIH 8 (upland jack pine). This amount would be within the amount expected under RNV. However, by decade 10, Alternative G would provide an amount of young upland jack pine exceeding the expected RNV by approximately 21%. This is because Alternative G's emphasis is on creating a similar amount of acreage in each forest type and age class (DEIS section 2.4.7).

Assuming a direct correlation between habitat availability and species populations, these conditions would result in population levels closer to the range of natural variability for much of the upland conifer habitat.

Under this alternative, the amount of young forest in MIH 9 (lowland black spruce) would slightly exceed (by approximately 6%) the amount expected under RNV in decade 2. By decade 10, the amount of young MIH 9 would decrease to levels approximately 18% below RNV. This represents a 61% increase over the amount of young lowland black spruce that currently exists by decade 2.

Finally, Alternative G would provide no young forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) in either decade 2 or 10. It would produce approximately 1000 acres in the outer zone (100-200') of MIH 10 in decade 2 and 570 acres in the outer zone of MIH 10 in decade 10. Currently, the existing amount of young forest in the inner zone of MIH 10 is approximately 626 acres with approximately 943 acres in the outer zone.

Effects on Superior- Alternative G

Starting as early as decade 1 the existing large amount of young forest in the BWCAW associated with the 1999 windstorm will grow out of the young forest category. In the upland forest category (MIH 1) the amount of young forest will drop 92% in the BWCAW by decade 2, moderating the impact of relatively high amounts of young forest created in the future by management actions outside the Wilderness.

On the Superior, Alternative G provides a moderate amount of young forest habitat in 6 of the 10 MIHs at decade 2 and in 7 of the 10 MIH at decade 10. With three exceptions, the amount of habitat produced would fall within the amounts predicted under RNV in both decades 2 and 10.

For the first exception, MIH 6 (upland spruce/fir), the amount of young forest that would be produced in decade 2 would be two and one-third times the amount expected under RNV. However, by decade 10, the amount of young upland spruce/fir would drop to within the middle of the levels expected under RNV.

The opposite situation is true for MIH 7 (red and white pine). Alternative G would produce a relatively low amount of young red and white pine in decade 2, approximately 73% lower than the amount expected under RNV. However, similar to MIH 6, the amount of young upland red and white pine forest would increase to levels that would fall just above (approximately 9%) the amount expected under RNV by decade 10.

The third exception is different. For MIH 8 (jack pine), the amount of young forest that would be produced under Alternative G in decade 2 would be approximately 41% below the amount expected for RNV. By decade 10, the amount would drop even further to approximately 86% below the amount expected under RNV. On the Superior, Alternative G would produce very low amounts of young MIH 8 in decades 2 and 10. The reduction in young jack pine could be caused by Alternative G's emphasis on shifting current age class distributions by reducing the amounts of forest in the younger age classes and increasing the amounts in the older age classes. However, the amount of mature/old jack pine that would be present on the Superior under Alternative G (see following section) would be moderately low.

Assuming a direct correlation between habitat availability and species populations, the conditions of young forest in MIHs 6 and 7 would eventually result in population levels closer to the range of natural variability for much of the upland conifer habitat. Conversely, the large reduction of young forest in MIH 8 (jack pine) could negatively affect its associated wildlife species. However, because the species associated with young jack pine forest are also associated with at least one other young MIH, the effects may not be severe.

Currently, the existing amount of young forest in the inner zone of MIH 10 is approximately 3725 acres with approximately 5331 acres in the outer zone. Alternative G would provide no young forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) in either decade 2 or 10. It would produce approximately 1600 acres in the outer zone (100-200') of MIH 10 in decade 2 and 2500 acres in the outer zone of MIH 10 in decade 10.

Mature/Old Forest

Alternatives A and C

With only a couple of exceptions, Alternatives A and C generally would provide mature/old forest on both the Chippewa and Superior National Forests that is below the estimated range of natural variability. Dualplan demonstrated that either Alternative A or C would provide the least amount of mature/old forest in all 10 of the MIHs in both decades 2 and 10 on both forests. However, with two possible exceptions these alternatives are likely to provide at least adequate representation of habitat amounts to maintain viable populations of species.

Under these alternatives, both the inner and outer zones of MIH 10 were modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model.

Effects on Chippewa – Alternatives A and C

Under Alternatives A and C, the amount of mature /old forest in MIH 1 (upland forest) would fall to levels approximately 37 to 43% below the amount currently present by decade 2 and exist at levels approximately 28 to 43% below the amount currently present by decade 10. This would put mature / old forest in MIH 1 at levels approximately 52 to 57% below levels expected under RNV in decade 2 and approximately 46 to 57% below levels expected under RNV in decade 10.

Similarly, the amount of mature / old forest in MIH 2 (upland deciduous) would fall to levels approximately 56 to 55% below the amount current present by decade 2 and exist at levels approximately 51 to 59% below the amount current present by decade 10. This would place mature / old forest in MIH 2 at levels approximately 38 to 49% below the amount expected under RNV in decade 2 and approximately 54 to 56% below the amount expected under RNV in decade 10. MIH 2 is currently present at levels <1% above RNV.

Assuming a direct correlation between habitat availability and species populations, the low levels of mature/old forest in MIHs 1 and 2 could result in negative impacts to their associated species. This is a factor contributing to the risk of loss of viability on the planning area for the northern goshawk (sensitive species/management indicator species under 36CFR 219.19 – see Section 3.3.6.1) and black-throated blue

warbler (sensitive species – see Section 3.3.5.b below). Although these species are at risk, impacts are not expected to cause a trend toward listing.

Dualplan indicates that Alternatives A and C would also produce noticeable decreases in mature / old forest in MIH 4 (aspen / birch) and MIH 8 (jack Pine). MIH 4 is currently present in quantities approximately five times the level expected under RNV. The reductions induced by Alternatives A and C would reduce the amount of mature / old forest in MIH 4 approximately 80% by decade 2 and 97% by decade 10, bringing the level of mature MIH 4 to a level slightly above RNV by decade 2 and within RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 4 (aspen/birch) under Alternatives A or C would create a dramatic reduction in population levels from current conditions but would result in population levels within those expected under the range of natural variability on National Forest land.
The amount of mature / old forest in MIH 8 (jack pine) would fall to levels approximately 81% below existing levels by decade 2. MIH 8 is currently present in amounts approximately 10% below the amounts expected under RNV. The effects of Alternatives A or C would bring the amount of MIH 8 to levels approximately 83% below RNV by decade 2. However, the amount of MIH 8 would increase to levels approximately 27% (Alternative A) to 7% (Alternative C) below the amount expected under RNV by decade 10.

Mature / old forest in MIH 6 (spruce / fir) would also be present at levels well below those expected under RNV. However, unlike MIH 8 (jack pine), MIH 6 is currently present at levels approximately 80% below levels expected under RNV. Under Alternatives A and C, the amount of MIH 6 would drop to approximately 87% below RNV by decade 2 and increase to levels approximately 69 to 75% below RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 6 (upland spruce) in decades 2 and 10 and in MIH 8 (jack pine) in decade 2 would result in population levels well below those expected under the range of natural variability on National Forest land. The low levels of mature/old forest in MIHs 6 and 8 present in the first few decades could negatively affect their associated species. This is of particular concern for species associated with MIH 8 (jack pine) because of the 81% decrease in MIH 8 from currently existing levels expected by decade 2. This is a factor contributing to the risk of loss of viability on the planning area for the bay-breasted warbler and spruce grouse (sensitive species) (see Section 3.3.5 below). Although these species are at risk, impacts are not expected to cause a trend toward listing. By decade 10, however, Alternatives A and C would provide adequate representation of mature/old MIH 8 (jack pine) to maintain viable populations of species.

Meanwhile, Alternatives A and C would tend to maintain the levels of mature / old forest in MIH 3 (upland northern hardwood), MIH 5 (upland conifer), MIH 7 (red and white pine), and MIH 9 (lowland black spruce) that are currently present. However, as the quantities of mature / old forest currently present in MIHs 3, 5, and 7 are 50 to 60% below the amounts expected under RNV, there is some risk that these alternatives may not provide adequate representation of mature/old habitat amounts needed to maintain viable populations of species. As noted above, low representation of mature/old forest is a contributing factor to the predicted risk of loss of viability, but not a trend toward federal listing, for four sensitive species (northern goshawk, black-throated blue warbler, bay-breasted warbler, and spruce grouse).

The quantity of mature / old forest in MIH 9 would decrease to levels approximately 15 to 19% below RNV (23 to 26% below currently existing levels) by decade 2. However, by decade 10 the quantity of mature / old forest in MIH 9 would increase to levels slightly above the amount expected under RNV.

Finally, Alternatives A and C would provide approximately 5800 (Alternative A) to 5400 (Alternative C) acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 5700 (Alternative A) to 5200 (Alternative C) acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Alternatives A and

C would provide approximately 7500 (Alternative A) to 7400 (Alternative C) acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 5200 (Alternative A) to 6100 (Alternative C) acres in the outer zone (100-200') of MIH 10.

Effects on Superior- Alternatives A and C

By decade 10, the existing composition of old/mature forest in the BWCAW changes rather dramatically as the upland deciduous MIHs (MIH 2 and 4) and the jack pine MIH (MIH 8) succeed into late successional conifer MIHs, particularly MIH 5 (upland conifer) and MIH 6 (upland spruce/fir). To a lesser extent, currently existing young and pole/immature stage red and white pine (MIH 7) and lowland black spruce (MIH 9) would grow into the old/mature stage, increasing the ranks of old/mature forest in these MIH as well. These increases in upland conifer and decreases in aspen/birch inside the BWCAW will moderate the overall impact of Alternatives A and C on old/mature forest levels in conifer MIHs outside of the BWCAW and exacerbate the impact of these Alternatives on old/mature deciduous and aspen/birch MIHs outside of the BWCAW.

Under Alternatives A and C, the amount of mature/old forest present in MIH 2 (upland deciduous) and MIH 4 (aspen/birch) in decade 2 would be two to two and one-quarter times higher than the amount expected under RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 2 and MIH 4 in decade 2 would result in population levels of associated species well above the range of natural variability on National Forest land. However, in decade 2 the amounts of mature/old MIH 2 and MIH 4 would be approximately 35% below currently existing levels, and by decade 10 the amounts of mature/old MIH 2 and MIH 4 would decrease to approximately 16 to 19% below the amount expected under RNV. Under Alternatives A and C, the decrease of these old/mature MIHs would be gradual over time inside the BWCAW, but would be exponential outside of the BWCAW, even at decade 2. Thus although overall population levels of associated species would be above RNV in decade 2, they could be dramatically affected outside of the BWCAW. Several species associated with these MIHs on the Superior are considered threatened, endangered, or sensitive (such as Northern goshawk, boreal owl, and black-throated blue warbler).

Similarly, the amount of mature/old forest present in MIH 8 (jack pine) in both Alternatives A and C would be approximately 47% above the amount expected under RNV in decade 2.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 8 in decade 2 would result in population levels above the range of natural variability on National Forest land. However, in decade 2 the amounts of mature/old MIH 8 would be approximately 15% below currently existing levels, and by decade 10 the amounts of mature/old MIH 8 would decrease to and within or slightly below the amount expected under RNV.

Under Alternatives A and C, the amount of mature / old forest in MIH 5 (upland conifer), MIH 6 (spruce / fir), and MIH 7 (red and white pine) would increase approximately 3 to 20% above currently existing levels by decade 2 and would continue to increase to levels approximately 31 to 64% above existing levels by decade 10. Even with these increases, the amount of MIHs 5, 6, and 7 would remain approximately 35 to 60% below the amount expected under RNV in decade 2, rising to within approximately 2 to 24% of the lower end of their expected range of natural variability by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in mature/old forest in these three MIHs (particularly MIH 6) in decade 2 of both Alternatives A and C would result in population levels well below the range of natural variability on National Forest land. The low level of mature/old forest in MIH 6 could negatively affect associated species in the first few decades, particularly those not associated with other habitat types. This is a factor contributing to the risk of loss of viability (in particular because of loss of well-distributed habitat) on the planning area for the boreal owl (sensitive species) (see Section 3.3.5 below).

Although this species is at risk in Alternatives A and C, impacts are not expected to cause a trend toward listing.

Meanwhile, the amount of mature / old forest in MIHs 1 (upland forest), 3 (upland northern hardwood), and 9 (lowland black spruce) would decrease from existing levels by approximately 3 to 23% by decade 2 but increase approximately 2 to 10% above existing levels by decade 10. MIHs 1 (upland forest) and 3 (upland northern hardwood) would fall to levels approximate 28 to 34% (MIH 1) and 14 to 21% (MIH 3) below RNV in decade 2, and 12 to 13% (MIH 1) and <1 to 2% by decade 10.

Assuming a direct correlation between habitat availability and species populations, these conditions would result in population levels below the range of natural variability for much of the upland forest and upland northern hardwoods habitat.

The amount of MIH 9 (lowland black spruce) would remain within the range expected under RNV in decade 2 of Alternative A, but would drop to 13% below the amount expected under RNV in decade 2 of Alternative C. By decade 10, the amount of MIH 9 would increase to levels slightly above RNV under both alternatives A and C.

Assuming a direct correlation between habitat availability and species populations, these conditions would result in population levels closer to the range of natural variability for much of the lowland black spruce habitat.

Finally, Alternatives A and C would provide approximately 18300 (Alternative A) to 16100 (Alternative C) acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 19600 (Alternative A) to 17100 (Alternative C) acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Alternatives A and C would each provide approximately 22800 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 21300 acres in the outer zone (100-200') of MIH 10.

Alternatives B and D

Alternatives B and D generally would provide highly favorable habitat conditions for species associated with mature/old forest on both the Chippewa and Superior National Forests. Dualplan demonstrated that either Alternative B or D would provide the amounts of mature/old forest in all 10 of the MIHs in decades 2 and 10 that trend toward the upper end of RNV.

Under this alternative, only the outer zone of MIH 10 was modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model. The inner zone was modeled as not suitable for timber production.

Effects on Chippewa- Alternatives B and D

With a few exceptions, either Alternative B or D would provide high amounts of mature/old forest in all 10 MIH in decades 2 and 10.

Under Alternative B, the amount of mature /old forest would increase from currently existing levels in MIHs 1 (upland forest), 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir), 7 (red and white pine), and MIH 10 (riparian upland forest) by decade 2. These MIHs would exhibit a substantial increase above decade 2 levels by decade 10.

Meanwhile, MIHs 2 (upland deciduous), 4 (aspen / birch), 8 (jack pine), and 9 (lowland black spruce) would decrease from currently existing levels. Currently, MIHs 2, and 4, and 9 are present at levels approximately <1% (MIH 2) to 80% (MIH 4) above levels expected under the range of natural variability. The reductions in these three MIHs would bring them either within (MIHs 2 and 9) or somewhat closer to (MIH 4) RNV. However, MIH 8 (jack pine) is already present at levels approximately 10% below RNV. The effects of Alternative B would further reduce levels of MIH 8 to approximately 40% below RNV. However, under Alternative B, all MIHs would be present at levels within the upper limits of RNV by decade 10.

Similarly, under Alternative D the amount of mature /old forest would increase from currently existing levels in MIHs 1 (upland forest), 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir), 7 (red and white pine), 9 (lowland black spruce) and MIH 10 (riparian upland forest) by decade 2. These MIHs would exhibit a substantial increase above decade 2 levels by decade 10.

Alternative D would also exhibit decreases in MIHs 2 (upland deciduous), 4 (aspen /birch), and 8 (jack pine) from currently existing levels by decade 2. Currently, MIHs 2 and 4 are present at levels approximately <1% (MIH 2) to 80% (MIH 4) above levels expected under the range of natural variability. The reductions in these two MIHs would bring them either within (MIH 2) or somewhat closer to (MIH 4) RNV. However, MIH 8 (jack pine) is already present at levels approximately 10% below RNV. The effects of Alternative D would further reduce levels of MIH 8 to approximately 66% below RNV. However, under Alternative D, all MIHs would be present at levels either within (MIHs 4 and 6) or approximately 2 to 59% above RNV by decade 10.

In Alternative B, the amount of mature/old forest in MIH 3, MIH 5, and MIH 8 would be approximately 40% to 44% below the amount expected under RNV. Similarly, the amount of mature/old MIH 6 would be approximately 65% below the amount expected under RNV in decade 2. However, the amount of mature/old forest in MIH 4 would be more than three times the amount expected under RNV. By decade 10, the amount of old/mature forest that would be present under Alternative B would be within the limits expected under RNV for all 10 MIHs.

Assuming a direct correlation between habitat availability and species populations, conditions in 6 of the 10 MIH at decade 2, would result in population levels within or slightly below the range of natural variability on National Forest land. However, conditions in MIH 3, MIH 5, MIH 6, and MIH 8 would result in population levels somewhat below the amount expected under the range of natural variability, and MIH 4 (aspen/birch) would result in population levels well above the range of natural variability on National Forest land.

Dualplan indicates that the amount of mature/old MIH 4 that would be present in decade 2 would be approximately 35% below existing levels, would rise to nearly twice the amount of decade 2 levels in decade 5, and would decrease to levels within the range of natural variability (almost one-sixth of decade 5 levels) in decade 10. Although Alternative B would provide some of the most favorable habitat conditions for species associated with mature/old aspen/birch, it could set up a “boom and bust” situation for these populations. Meanwhile, conditions in MIH 6 (upland spruce/fir) in decade 2 would be less than half the amount expected under RNV. This would be of more concern if decade 2 levels of mature/old upland spruce fir were not showing an almost two-fold increase over existing levels.

By decade 10, however, mature/old forest levels in Alternative B would be within the amounts expected under RNV for all 10 MIHs, creating favorable habitat conditions for all associated species.

With six exceptions, the amount of mature/old forest in decade 2 of Alternative D would be within or somewhat below the amounts expected under RNV. In MIH 9 (lowland black spruce/tamarack), Alternative D would provide levels of mature/old lowland black spruce slightly above the amount expected under RNV. In decade 2, the amount of mature/old forest in MIH 3 (northern hardwoods), and MIH 5 (upland conifer) would be approximately 47% below the amount expected under RNV. Similarly, the amount of mature/old forest in MIH 6 (upland spruce/fir) and MIH 8 (jack pine) would be approximately 70% below the amount expected under RNV in decade 2. However, the amount of mature/old forest in MIH 4 (aspen/birch) would be approximately two and one-half times the amount expected under RNV.

With two exceptions, the amount of mature/old forest present in all 10 MIHs under Alternative D in decade 10 would be slightly above the amounts expected under RNV. In MIH 4 (aspen/birch) the amount of mature/old forest in decade 10 of Alternative D would be within, not above, the amounts expected under

RNV. However, in MIH 8 (jack pine) the amount of mature/old forest in decade 10 would be almost two and one-half times the amount expected under RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in 4 of the 10 MIH at decade 2, would result in population levels of associated species within or slightly above or below the range of natural variability on National Forest land, creating favorable habitat conditions for all associated species. However, conditions in MIH 4 (aspen/birch) would promote associated species at levels well above the range of natural variability on National Forest land.

Dualplan indicates that the amount of mature/old MIH 4 that would be present in decade 2 would be 30% below existing levels, would rise to nearly twice the amount of decade 2 levels in decade 5, and would decrease to levels within the range of natural variability (almost one-seventh of decade 5 levels) in decade 10. Although Alternative D would provide some of the most favorable habitat conditions for species associated with mature/old aspen/birch, it could set up a "boom and bust" situation for these populations. Meanwhile, conditions in MIH 6 (upland spruce/fir) in decade 2 would be approximately 70% below the amount expected under RNV. This would be of more concern if decade 2 levels of mature/old upland spruce fir were not showing a 33% increase over existing levels.

Finally, Alternatives B and D would provide approximately 7900 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 9100 (Alternative B) to 8300 (Alternative D) acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Alternatives B and D would each provide approximately 10000 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 11400 (Alternative B) and 11700 (Alternative D) acres in the outer zone (100-200') of MIH 10.

Effects on Superior-Alternatives B and D

By decade 10, the existing composition of old/mature forest in the BWCAW changes rather dramatically as the upland deciduous MIHs (MIH 2 and 4) and the jack pine MIH (MIH 8) succeed into late successional conifer MIHs, particularly MIH 5 (upland conifer) and MIH 6 (upland spruce/fir). To a lesser extent, currently existing young and pole/immature stage red and white pine (MIH 7) and lowland black spruce (MIH 9) would grow into the old/mature stage increasing the ranks of old/mature forest in these MIH as well. These increases in upland conifer and decreases in aspen/birch inside the BWCAW will add to the overall impact of Alternatives B and D on old/mature forest levels in conifer MIHs outside of the BWCAW and moderate the impact of these Alternatives on old/mature deciduous and aspen/birch MIHs outside of the BWCAW.

Under Alternatives B and D, the amount of mature /old forest would increase from currently existing levels in MIHs 1 (upland forest), 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir), 7 (red and white pine), 9 (lowland black spruce) and the inner zone (0 – 100') of MIH 10 (riparian upland forest) by decade 2. With the exception of MIH 9, these MIHs are currently present in levels approximately 11 to 67% below the levels expected for them under RNV. Thus, the limited increases in the amount of mature / old forest predicted under Alternatives B and D for decade 2 would do little toward moving these MIHs much closer to RNV in that time. Fortunately, these MIHs (1, 3, 5, 6, 7 9, and 10) would exhibit a substantial increase above decade 2 levels by decade 10, pushing their quantities to levels within the upper limits of RNV under Alternative B or within to 36% above the upper limits of RNV under Alternative D.

Meanwhile, MIHs 2 (upland deciduous), 4 (aspen / birch), 8 (jack pine), and the outer zone (100 – 200') of MIH 10 (upland riparian forest) would decrease from currently existing levels. Currently, MIHs 2, and 4, and 8 are present at levels approximately 71% (MIH 2), 69% (MIH 4), and 47% (MIH 8) above levels expected under the range of natural variability. The limited reductions in these three MIHs under Alternatives B and D would not do much toward bringing them closer to RNV by decade 2. However, by decade 10, all MIHs would be present at levels

within the upper limits of RNV under Alternative B or within to 36% above the upper limits of RNV under Alternative D.

Assuming a direct correlation between habitat availability and species populations, resulting population levels of associated species would be somewhat similar to currently existing levels in decade 2 and at the upper limits of the range of natural variability on National Forest land by decade 10 under Alternative B or up to 36% above the .upper limits of RNV under Alternative D. Conditions in mature/old MIH 2 (upland deciduous), MIH 4 (aspen/birch), and MIH 8 (jack pine) would continue to result in population levels well above the range of natural variability on National Forest land.

Under Alternative B, Dualplan indicates that decade 2 levels of MIH 2 and MIH 4 would be approximately 12% below existing, rise slightly above decade 2 levels in decade 5, and decrease dramatically to levels one-third of decade 2 levels to fall within the range of natural variability in decade 10. Although Alternative B would provide highly favorable habitat conditions for species associated with mature/old aspen/birch, it could set up a "boom and bust" situation for these populations. Meanwhile, decade 2 levels of MIH 8 would be approximately 5% below existing levels and would continue to decrease in decades 5 and 10 to levels within the range of natural variability.

In contrast, conditions in MIH 6 (upland spruce/fir) and MIH 5 (upland conifer) in decade 2 would be 60% and 41% below the amount expected under RNV. This would be of more concern for species associated with these MIHs if decade 2 levels of mature/old upland conifer and upland spruce/fir were not showing an increase over existing levels.

By decade 10, however, mature/old forest levels in Alternative B would be within the amounts expected under RNV for all 10 MIHs, creating favorable habitat conditions for all associated species.
Under Alternative D, Dualplan indicates that the amount of mature/old MIH 2 and MIH 4 that would be present in decade 2 would be approximately 20% below existing levels and would continue to decrease through decade 5 to decade 10 to levels approximately 33% (MIH 2) to 43% (MIH 4) above the range of natural variability. Alternative D would provide some of the most favorable habitat conditions for species associated with mature/old upland deciduous and aspen/birch.

Meanwhile, conditions in MIH 6 (upland spruce/fir) in decade 2 would be approximately 56% below the amount expected under RNV. This would be of more concern if decade 2 levels of mature/old upland spruce fir were not showing a 27% increase over existing levels, thus actually increasing the amount of habitat for its associated species.

Finally, Alternatives B and D would provide approximately 21300 (Alternative B) and 21200 (Alternative D) acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 26300 (Alternative B) to 24300 (Alternative D) acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Alternatives B and D would each provide approximately 27500 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 35000 (Alternative B) and 35600 (Alternative D) acres in the outer zone (100-200') of MIH 10.

Alternatives Modified E, F, and G

Alternatives Modified E, F, and G generally are considered to be moderate and very similar to each other. However, because there are some important differences between them, they will be discussed separately in order to better illustrate these important differences and reduce the complexity of describing these alternatives in one all-encompassing analysis.

Modified Alternative E

Modified Alternative E on both Forests would generally benefit associated species in all 10 MIH, because with one or two exceptions it would provide a moderate amount of mature/old forest in all decades. The amount of mature/old forest within each MIH would be generally closer to the amounts expected under the range of natural variability than currently

exists, but in decades or MIHs where amount of habitat is less than RNV, there would still be adequate habitat.

Under this alternative, only the outer zone of MIH 10 was modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model. The inner zone was modeled as not suitable for timber production.

Effects on Chippewa – Modified Alternative E

Under Modified Alternative E, the amount of mature/old forest in MIHs 1 (upland forest) and 2 (upland deciduous) would fall to levels approximately 10% (MIH 1) to 24% (MIH 2) below the amount currently present by decade 2 and exist at levels approximately 15% above (MIH 1) to 13% below (MIH 2) the amount currently present by decade 10. This would put mature / old forest in MIH 1 at levels approximately 32% below levels expected under RNV in decade 2 and approximately 11% below levels expected under RNV in decade 10. Meanwhile, levels of MIH 2 (upland deciduous) would be at levels approximately 14% below RNV in decade 2 and 1% below RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, the levels of mature/old forest in MIHs 1 and 2 would result in population levels somewhat less than currently existing levels in decade 2, increasing to levels closer to the amounts expected under RNV by decade 10.

Under Modified Alternative E, the amount of mature/old forest habitat in MIHs 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir), and 7 (red and white pine) would be approximately 21% to 34% higher in decade 2 than the amount that currently exists. By decade 10, the amount of mature / old forest in these four MIHs would increase to levels approximately 41% to 70% above existing levels. However, the amount of mature/old forest habitat produced in these four MIHs would still fall below the amounts predicted under RNV in both decades 2 and 10.

For MIH 3 (northern hardwoods) and MIH 5 (upland conifer), Modified Alternative E would provide approximately one-half of the mature/old forest in decade 2 that is expected under RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 3 and MIH 5 would result in population levels of species associated with these mature/old forest habitats well below the range of natural variability on National Forest land. This would be of more concern if decade 2 levels of mature/old northern hardwoods and upland conifer were not showing increases over existing levels, thus actually increasing the amount of habitat for their associated species. By decade 10, the amounts of mature/old forest in MIH 3 and MIH 5 would increase to levels still below, but closer to the amounts expected under RNV.

Conditions in MIH 6 (upland spruce/fir) and MIH 7 (red and white pine) in decade 2 would be approximately 75% (MIH 6) and 23% (MIH 7) below the amount expected under RNV. As with the previous MIHs, this would be of more concern if decade 2 levels of mature/old upland spruce fir and red and white pine were not showing an increase over existing levels, thus actually increasing the amount of habitat for associated species. Furthermore, by decade 10, mature/old forest levels in MIH 6 and MIH 7would continue to rise, falling within 34% (MIH 6) and 12% (MIH 7) of the amount expected under RNV, and creating more favorable habitat conditions for all species associated with these mature/old habitats.

Meanwhile, the amount of mature/old forest in MIHs 4 (aspen / birch) and 9 (lowland black spruce) would decrease to levels approximately 53% (MIH 4) to 6% (MIH 9) below currently existing levels by decade 2. However, by decade 10, the amount of mature/old forest in MIHs 4 and 9 would be at levels approximately 59% (MIH 4) to 2% (MIH 9) below currently existing levels.

Though decreasing, the amount of mature/old forest produced under Modified Alternative E at decade 2 for MIH 4 (aspen / birch) would be almost two and one-half times higher than the amounts expected under

RNV. By decade 10, the amount of mature/old forest in MIH 4 would decrease to levels approximately two times the amount expected under the range of natural variability.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 4 (aspen/birch), would result in population levels of associated species above the range of natural variability on National Forest land. This would be of more concern if decade 2 levels of mature/old aspen/birch were not showing more than a 50% decrease over existing levels, thus actually decreasing the amount of habitat for its associated species.

The quantity of mature / old forest in MIH 9 would decrease to levels within RNV by decade 2 and slightly less than 1% above RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 9 would decrease slightly from current conditions but still remain close to the levels expected under RNV.

The amount of mature/old forest in MIH 8 (jack pine) would fall to levels approximately 70% below existing levels by decade 2. MIH 8 is currently present in amounts approximately 10% below the amounts expected under RNV. The effects of Modified Alternative E would bring the amount of MIH 8 to levels approximately 73% below RNV by decade 2. However, the amount of MIH 8 would increase to levels approximately 3% below the amount expected under RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 8 (jack pine) in decade 2 would result in population levels well below those expected under the range of natural variability on National Forest land. The low levels of mature/old forest in MIH 8 present in the first few decades could negatively affect associated species. This is of particular concern for species associated with MIH 8 (jack pine) because of the 70% decrease in MIH 8 from currently existing levels expected by decade 2. By decade 10, however, Modified Alternative E would provide adequate representation of mature/old MIH 8 (jack pine) to maintain viable populations of species.

Finally, Modified Alternative E would provide approximately 7700 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 7400 acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Modified Alternative E would provide approximately 9900 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 9700 acres in the outer zone (100-200') of MIH 10.

Effects on Superior- Modified Alternative E

By decade 10, the existing composition of old/mature forest in the BWCAW changes rather dramatically as the upland deciduous MIHs (MIH 2 and 4) and the jack pine MIH (MIH 8) succeed into late successional conifer MIHs, particularly MIH 5 (upland conifer) and MIH 6 (upland spruce/fir). To a lesser extent, currently existing young and pole/immature stage red and white pine (MIH 7) and lowland black spruce (MIH 9) would grow into the old/mature stage, increasing the ranks of old/mature forest in these MIH as well. These increases in upland conifer and decreases in aspen/birch inside the BWCAW will add to the overall impact of Modified Alternative E on old/mature forest levels in conifer MIHs outside of the BWCAW and moderate the impact of this alternative on old/mature deciduous and aspen/birch MIHs outside of the BWCAW.

Under Modified Alternative E, the amount of mature/old forest in MIHs 2 (upland deciduous), 4 (aspen / birch), and 8 (jack pine) would fall to levels approximately 9% (MIH 8) to 30% (MIH 4) below the amount currently present by decade 2 and continue to decline to levels approximately 42% (MIH 8) to 64% below (MIH 4) the amount currently present by decade 10. This would put mature / old forest in MIH 2 (upland deciduous) at levels approximately 60% above levels expected under RNV in decade 2 and approximately 31% above levels expected under RNV in decade 10. Meanwhile, levels of MIH 4 (aspen / birch) would be at levels approximately 56% above RNV in decade 2 and 15% above RNV by decade 10. MIH 8 (jack pine) would be present at levels

approximately 41% above RNV in decade 2 and 9% above RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 2 (upland deciduous), MIH 4 (aspen/birch), and MIH 8 (jack pine) would promote associated species at levels well above their populations' range of natural variability on National Forest land. This would be of more concern if decade 2 and 10 levels of mature/old MIH 2 and MIH 4 were not showing a substantial decrease from existing levels, thus actually decreasing the amount of habitat for species associated with these two MIHs.

The amount of mature/old forest in MIHs 1 (upland forest) and MIH 3 (upland northern hardwood) would decrease slightly (approximately 7% in MIH 1 and less than 1% in MIH 3) from currently existing levels by decade 2. By decade 10, the amount of mature/old forest in MIHs 1 and 3 would increase to levels approximately 20% (MIH 1) and 16% (MIH 3) above currently existing conditions. Although the amount of MIHs 1 and 3 would be approximately 21% (MIH 1) and 11% (MIH 3) below levels expected under RNV in decade 2, by decade 10 the amount of mature/old forest in both MIHs would be within the amounts expected under RNV.

Assuming a direct correlation between habitat availability and species populations, the levels of mature/old forest in MIHs 1 (upland forest) and 3 (upland northern hardwood) would result in population levels somewhat less than currently existing levels in decade 2, increasing to levels expected under RNV by decade 10.

Conditions in MIH 5 (upland conifer), MIH 6 (spruce / fir) and MIH 7 (red and white pine) in decade 2 would be approximately 38% (MIH 5), 57% (MIH 6) and 28% (MIH 7) below the amount expected under RNV. This would be of more concern if decade 2 levels of mature/old upland conifer, spruce /fir, and red and white pine were not showing an increase (14, 23, and 28% respectively) over existing levels, thus actually increasing the amount of habitat for associated species. Furthermore, by decade 10, mature/old forest levels in MIH 5, 6 and 7would continue to rise, to be within the amount expected under RNV, creating more favorable habitat conditions for all species associated with these mature/old habitats.

The quantity of mature / old forest in MIH 9 (lowland black spruce) would increase by 2% over existing conditions to be at levels <1% above RNV by decade 2. By decade 10, the amount of MIH 9 would decrease slightly to <1% below current conditions to be within RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 9 would be similar to current conditions and remain close to the levels expected under RNV.

Finally, Modified Alternative E would provide approximately 21000 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 22700 acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Modified Alternative E would provide approximately 27100 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 30800 acres in the outer zone (100-200') of MIH 10.

Alternative F

Alternative F on both Forests, like Modified Alternative E, would generally benefit associated species in all 10 MIH, because with one or two exceptions it would provide a moderate amount of mature/old forest in all decades. The amount of mature/old forest within each MIH would be generally within or slightly below the amounts expected under the range of natural variability in decade 2; but in MIHs where amount of habitat is less than RNV, there would still be adequate habitat. By decade 10, the amount of mature/old forest within each MIH would be in the middle of the range of natural variability.

Under this alternative, both the inner and outer zones of MIH 10 were modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5

(partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model.

Effects on Chippewa- Alternative F

Under Alternative F, the amount of mature/old forest in MIHs 1 (upland forest) 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir) and 7 (red and white pine) would increase to levels approximately 2% (MIH 1) to 45% (MIH 6) above currently existing levels by decade 2 and increase again to levels approximately 30% (MIH 1) to 82% (MIH 6) above existing levels by decade 10. Although the amount of mature/old forest in these five MIHs would still fall 23% (MIH 1) to 64% (MIH 6) below the amounts predicted under RNV in decade 2, by decade 10 all of the MIHs would be present in quantities in the middle of their respective ranges of natural variability.

Assuming a direct correlation between habitat availability and species populations, conditions in MIHs 1, 3, 5, 6, and 7 would result in population levels of species associated with these mature/old forest habitats still well below the range of natural variability on National Forest land. This would be of more concern if decade 2 levels of these MIHs were not showing increases over existing levels, thus actually increasing the amount of habitat for their associated species. By decade 10, the amounts of mature/old forest, and thus the population levels of associated species in these five MIHs would increase to levels within the amounts expected under RNV.

Meanwhile, the amount of mature/old forest produced under Alternative F in MIHs 2 (upland deciduous) and 9 (lowland black spruce) would decrease slightly to levels approximately 12% (MIH 2) and 8% (MIH 9) below currently existing levels, placing these MIH at levels within the lower range of their respective ranges of natural variability. By decade 10, both MIH 2 and MIH 9 would increase slightly to levels approximately 7% (MIH 2) and 6% (MIH 9) below currently existing levels. This would place both of these MIHs and their associated species populations at levels within the middle of their respective ranges of natural variability by decade 10.

Though decreasing from currently existing levels by 40%, the amount of mature/old forest produced under Alternative F at decade 2 for MIH 4 (aspen / birch) would be three times higher than the amount expected under RNV. However, by decade 10, the amount of mature/old forest in MIH 4 would decrease from currently existing levels by approximately 93% to levels within the middle of the range of natural variability.

Although Alternative F would provide highly favorable habitat conditions for species associated with mature/old aspen/birch, it could set up a “boom and bust” situation for these populations.

The amount of mature/old forest in MIH 8 (jack pine) would fall to levels approximately 32% below existing levels by decade 2. MIH 8 is currently present in amounts approximately 10% below the amounts expected under RNV. The effects of Alternative F would bring the amount of MIH 8 to levels approximately 39% below RNV by decade 2. However, the amount of MIH 8 would increase to levels within the amount expected under RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 8 (jack pine) in decade 2 would result in population levels below those expected under the range of natural variability on National Forest land. By decade 10, however, Modified Alternative E would provide adequate representation of mature/old MIH 8 (jack pine) to maintain viable populations of species.

Finally, Alternative F would provide approximately 7700 acres of mature/old forest in the inner zone (0 – 100’) of MIH 10 (upland riparian forest) and approximately 8500 acres in the outer zone (100-200’) of MIH 10 in decade 2. In decade 10, Alternative F would provide approximately 9300 acres of mature/old forest in the inner zone (0 – 100’) of MIH 10 (upland riparian forest) and approximately 10300 acres in the outer zone (100-200’) of MIH 10.

Effects on Superior- Alternative F

By decade 10, the existing composition of old/mature forest in the BWCAW changes rather dramatically as

the upland deciduous MIHs (MIH 2 and 4) and the jack pine MIH (MIH 8) succeed into late successional conifer MIHs, particularly MIH 5 (upland conifer) and MIH 6 (upland spruce/fir). To a lesser extent, currently existing young and pole/immature stage red and white pine (MIH 7) and lowland black spruce (MIH 9) would grow into the old/mature stage increasing the ranks of old/mature forest in these MIH as well. These increases in upland conifer and decreases in aspen/birch inside the BWCAW will moderate the overall impact of Alternative F on old/mature forest levels in conifer MIHs outside of the BWCAW and exacerbate the impact of this Alternative on old/mature deciduous and aspen/birch MIHs outside of the BWCAW.

Under Alternative F, the amount of mature/old forest in MIHs 2 (upland deciduous), 4 (aspen / birch), and 8 (jack pine) would fall to levels approximately 12% (MIH 8) to 17% (MIH 4) below the amount currently present by decade 2 and continue to decline to levels approximately 51% (MIH 8) to 72% below (MIH 2) the amount currently present by decade 10. This would put mature / old forest in these MIHs at approximately 40% (MIH 8) to 66% (MIH 2) above levels expected under RNV by decade 2. However, by decade 10, the amount of mature/old forest in these MIHs would be within the middle of their predicted ranges of natural variability.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 2 (upland deciduous), MIH 4 (aspen/birch), and MIH 8 (jack pine) in decade 2 would promote associated species at levels above their populations' range of natural variability on National Forest land. This would be of more concern if decade 2 and 10 levels of mature/old MIH 2, MIH 4, and MIH 8 were not showing substantial decreases from existing levels, thus actually decreasing the amount of habitat for species associated with these two MIHs. By decade 10, the levels of mature/old forest in these MIHs would result in population levels within the amounts expected under RNV.

The amount of mature/old forest in MIHs 1 (upland forest) and MIH 3 (upland northern hardwood) would decrease slightly (approximately 4% in MIH 1 and 3% in MIH 3) from currently existing levels by decade 2. By decade 10, the amount of mature/old forest in MIHs 1 and 3 would increase to levels approximately 23% (MIH 1) and 18% (MIH 3) above currently existing conditions. Although the amount of MIHs 1 and 3 would be approximately 18% (MIH 1) and 14% (MIH 3) below levels expected under RNV in decade 2, by decade 10 the amount of mature/old forest in both MIHs would be within the amounts expected under RNV.

Assuming a direct correlation between habitat availability and species populations, the levels of mature/old forest in MIHs 1 (upland forest) and 3 (upland northern hardwood) would result in population levels somewhat less than currently existing levels in decade 2, increasing to levels expected under RNV by decade 10.

Conditions in MIH 5 (upland conifer), MIH 6 (spruce / fir) and MIH 7 (red and white pine) in decade 2 would be approximately 43% (MIH 5), 61% (MIH 6) and 35% (MIH 7) below the amount expected under RNV. This would be of more concern if decade 2 levels of mature/old upland conifer, spruce /fir, and red and white pine were not showing an increase (7, 15, and 21% respectively) over existing levels, thus actually increasing the amount of habitat for associated species. Furthermore, by decade 10, mature/old forest levels in MIH 5, 6 and 7 would continue to rise, to be within the amount expected under RNV, creating more favorable habitat conditions for all species associated with these mature/old habitats.

The quantity of mature / old forest in MIH 9 (lowland black spruce) would increase by 1% over existing conditions to be at levels <1% above RNV by decade 2. By decade 10, the amount of MIH 9 would decrease by 3% below current conditions to be within RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 9 would be similar to current conditions and remain close to the levels expected under RNV.

Finally, Alternative F would provide approximately 20400 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and

approximately 22900 acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Alternative F would provide approximately 26600 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 28700 acres in the outer zone (100-200') of MIH 10.

Alternative G

As with Alternatives Modified E and F, Alternative G would generally benefit associated species in all 10 MIH on both forests, because with one or two exceptions it would provide a moderate amount of mature/old forest in all decades. The amount of mature/old forest within each MIH would be generally within or slightly below the amounts expected under the range of natural variability, but in MIHs where amount of habitat is less than RNV, there would still be adequate habitat.

Under this alternative, only the outer zone of MIH 10 was modeled in Dualplan as suitable for timber production. To generally reflect the MFRC guidelines, only vegetation management treatments # 5 (partial cut with residual basal area of 30) and # 17 (no harvest) were used in the model. The inner zone was modeled as not suitable for timber production.

Effects on Chippewa- Alternative G

Similar to Alternative F, the amount of mature/old forest in MIHs 1 (upland forest) 3 (upland northern hardwood), 5 (upland conifer), 6 (spruce / fir) and 7 (red and white pine) would increase to levels approximately 5% (MIH 1) to 35% (MIH 6) above currently existing levels by decade 2 and increase again to levels approximately 22% (MIH 1) to 75% (MIH 6) above existing levels by decade 10. Even with these increases, the amount of mature/old forest in these five MIHs would still fall 28% (MIH 1) to 70% (MIH 6) below the amounts predicted under RNV in decade 2. By decade 10, however, MIH 7 would be present in quantities within its range of natural variability, MIH 5 would be present in quantities less than 1% below its RNV, MIH 1 would be present in quantities approximately 3% below RNV, and MIHs 3 and 6 would be present in quantities approximately 20 to 27% below RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in MIHs 1, 3, 5, 6, and 7 would result in population levels of species associated with these mature/old forest habitats below the range of natural variability on National Forest land. This would be of more concern if decade 2 levels of these MIHs were not showing increases over existing levels, thus actually increasing the amount of habitat for their associated species. By decade 10, the amounts of mature/old forest, and thus the population levels of associated species in these five MIHs would increase to levels within or closer to the amounts expected under RNV.

Meanwhile, the amount of mature/old forest produced under Alternative G in MIH 2 (upland deciduous) would decrease to levels approximately 18% (MIH 2) below currently existing levels, placing MIH 2 at a level approximately 6% below its range of natural variability. By decade 10, MIH 2 would increase very slightly to levels approximately 17% below currently existing levels. This would keep MIH 2 and its associated species populations at levels approximately 6% below its range of natural variability by decade 10.

Though decreasing from currently existing levels by 41%, the amount of mature/old forest produced under Alternative G at decade 2 for MIH 4 (aspen / birch) would be almost three times higher than the amount expected under RNV. However, by decade 10, the amount of mature/old forest in MIH 4 would decrease from currently existing levels by approximately 71% to levels approximately 32% above the range of natural variability.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 4 (aspen/birch), would result in population levels well above the expected range of natural variability on National Forest land. This would be of more concern if decade 2 levels of mature/old aspen/birch were not exhibiting a 41% decrease over existing levels, thus actually decreasing the amount of habitat for its associated species. By decade 10, the amount of mature/old forest in MIH 4 would decrease to be approximately 32% higher than the amount expected under RNV. Although Alternative G would provide

highly favorable habitat conditions for species associated with mature/old aspen/birch, it could set up a moderate "boom and bust" situation for these populations.

The amount of mature/old forest in MIH 8 (jack pine) would fall to levels approximately 43% below existing levels by decade 2. MIH 8 is currently present in amounts approximately 10% below the amount expected under RNV. The effects of Alternative G would bring the amount of MIH 8 to levels approximately 49% below RNV by decade 2. However, the amount of MIH 8 would increase to levels approximately 50% above the amount expected under RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 8 (jack pine) in decade 2 would result in population levels below those expected under the range of natural variability on National Forest land. By decade 10, however, Modified Alternative E would provide highly favorable habitat conditions for species associated with mature/old jack pine and could set up a "boom and bust" situation for these populations.

The quantity of mature / old forest in MIH 9 (lowland black spruce) would decrease to levels within RNV by decade 2 and continue to be within RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 9 would decrease slightly from current conditions but still remain close to the levels expected under RNV.

Finally, Alternative G would provide approximately 7900 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 8200 acres in the outer zone (100-200') of MIH 10 in decade 2. In decade 10, Alternative G would provide approximately 10000 acres of mature/old forest in the inner zone (0 – 100') of MIH 10 (upland riparian forest) and approximately 10600 acres in the outer zone (100-200') of MIH 10.

Effects on Superior- Alternative G

By decade 10, the existing composition of old/mature forest in the BWCAW changes rather dramatically as the upland deciduous MIHs (MIH 2 and 4) and the jack pine MIH (MIH 8) succeed into late successional conifer MIHs, particularly MIH 5 (upland conifer) and MIH 6 (upland spruce/fir). To a lesser extent, currently existing young and pole/immature stage red and white pine (MIH 7) and lowland black spruce (MIH 9) would grow into the old/mature stage increasing the ranks of old/mature forest in these MIH as well. These increases in upland conifer and decreases in aspen/birch inside the BWCAW will moderate the overall impact of Alternative G on old/mature forest levels in conifer MIHs outside of the BWCAW and exacerbate the impact of this Alternative on old/mature deciduous and aspen/birch MIHs outside of the BWCAW.

Under Alternative G, the amount of mature/old forest in MIHs 2 (upland deciduous) and 4 (aspen / birch), would fall to levels approximately 20% below the amount currently present by decade 2 and continue to decline to levels approximately 68% below the amount currently present by decade 10. This would put mature/old forest in these MIHs at approximately 62% above levels expected under RNV by decade 2. However, by decade 10, the amount of mature/old forest in these MIHs would have decreased to be approximately 6% above their predicted ranges of natural variability.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 2 (upland deciduous) and MIH 4 (aspen/birch) in decade 2 would promote associated species at levels above their populations' range of natural variability on National Forest land. This would be of more concern if decade 2 and 10 levels of mature/old MIH 2 and MIH 4 were not showing substantial decreases from existing levels, thus actually decreasing the amount of habitat for species associated with these two MIHs. By decade 10, the levels of mature/old forest in these MIHs would result in population levels slightly above the amounts expected under RNV.

The amount of mature/old forest in MIHs 1 (upland forest) and MIH 3 (upland northern hardwood) would decrease slightly (approximately 6% in MIH 1 and 2%

in MIH 3) from currently existing levels by decade 2. By decade 10, the amount of mature/old forest in MIHs 1 and 3 would increase to levels approximately 20% (MIH 1) and 14% (MIH 3) above currently existing conditions. Although the amount of MIHs 1 and 3 would be approximately 20% (MIH 1) and 13% (MIH 3) below levels expected under RNV in decade 2, by decade 10 the amount of mature/old forest in both MIHs would be within the amounts expected under RNV.

Assuming a direct correlation between habitat availability and species populations, the levels of mature/old forest in MIHs 1 (upland forest) and 3 (upland northern hardwood) would result in population levels somewhat less than currently existing levels in decade 2, increasing to levels expected under RNV by decade 10.

Conditions in MIH 5 (upland conifer), MIH 6 (spruce / fir) and MIH 7 (red and white pine) in decade 2 would be approximately 41% (MIH 5), 61% (MIH 6) and 34% (MIH 7) below the amount expected under RNV. This would be of more concern if decade 2 levels of mature/old upland conifer, spruce /fir, and red and white pine were not showing an increase (11, 14, and 21% respectively) over existing levels, thus actually increasing the amount of habitat for associated species. Furthermore, by decade 10, mature/old forest levels in MIH 5, 6 and 7would continue to rise, to be within (MIHs 5 and 6) or approximately 2% below (MIH 7) the amount expected under RNV, creating more favorable habitat conditions for all species associated with these mature/old habitats.

The amount of mature/old forest in MIH 8 (jack pine) would fall to levels approximately 9% below existing levels by decade 2. MIH 8 is currently present in amounts approximately 47% above the amount expected under RNV. The effects of Alternative G would bring the amount of MIH 8 to levels approximately 42% above RNV by decade 2. However, the amount of MIH 8 would dramatically decrease to levels approximately 70% below existing conditions to be 34% below the amount expected under RNV by decade 10.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 8 (jack pine) in decade 2 would result in population levels above those expected under the range of natural variability on National Forest land. By decade 10, however, Modified Alternative E would provide somewhat unfavorable habitat conditions for species associated with mature/old jack pine and could set up a “boom and bust” situation for these populations.

The quantity of mature / old forest in MIH 9 (lowland black spruce) would increase by 3% over existing conditions to be at levels 2% above RNV by decade 2. By decade 10, there would be very little change in the amount of mature/old lowland black spruce. Thus the amount of MIH 9 would remain at 2% above RNV.

Assuming a direct correlation between habitat availability and species populations, conditions in MIH 9 would be similar to current conditions and remain close to the levels expected under RNV.

Finally, Alternative G would provide approximately 21300 acres of mature/old forest in the inner zone (0 – 100’) of MIH 10 (upland riparian forest) and approximately 24900 acres in the outer zone (100-200’) of MIH 10 in decade 2. In decade 10, Alternative F would provide approximately 27500 acres of mature/old forest in the inner zone (0 – 100’) of MIH 10 (upland riparian forest) and approximately 31800 acres in the outer zone (100-200’) of MIH 10. Though the amount of mature/old riparian forest would remain close to existing levels in decade 2, the amounts would increase approximately 23% (inner) and 17% outer above existing levels by decade 10.

Cumulative Effects for Management Indicator Habitats 1-10

Each Management Indicator Habitat (MIH) encompasses large areas in various locations, mixtures, and proportions on both the Chippewa and Superior National Forests. Because the planning area is so large, and modeling data was projected out to the tenth decade, the previous section of this document on

the direct and indirect effects of the alternatives on the first 10 MIH could be considered a relatively detailed cumulative effects analysis. However, this section will attempt to summarize the effects of the alternatives on MIHs 1-10 in relation to other past, present, and reasonably foreseeable future actions on all land ownerships in the planning area, namely the Northern Superior Uplands (NSU) and Minnesota Drift and Lake Plains (DLP) Ecological Sections. The ecological Section provides an appropriate scale for considering MIH conditions that occurred on landscape ecosystems operating within the range of natural variability (RNV). Considering the RNV conditions at this scale provides important insights to ensuring long-term ecological sustainability and maintaining inherent biological diversity.

Although it is difficult and there is uncertainty, it is possible to make some basic assumptions about reasonably foreseeable actions in NSU and DLP. Appendix H of this document provides background on past, present, and reasonably foreseeable future actions based on the analyses performed in the Minnesota Generic Environmental Impact Statement on Timber Harvesting (GEIS) (Jaakko Poyry 1994) and Forest Management in Minnesota and the overall vision for long-range planning across land ownerships and forest types established by the Minnesota Forest Resources Council Landscape Committee (MFRC 2003a, 2003b), of which the Forest Service is a member.

For purposes of analysis, this section describes how the alternatives respond to conditions discussed in the GEIS and how alternatives contribute to the general goals of the Landscape Committee, even though there is no assumption in this section about a particular or designated role for the National Forests in relation to the goals.

The cumulative effects section in Vegetation Management in Chapter 3.2.1 provides additional analysis vegetation composition and structure that provide additional context for MIH.

Chippewa NF

The Chippewa National Forest manages approximately 8% of the forested lands in the Northern Minnesota Drift and Lake Plains (DLP) Ecological Section. Table FAC-1 in the Vegetation Section (3.1) of this document displays a comparison of the existing amounts of forest types and age classes on the Chippewa National Forest and on all lands within the DLP to RNV values. The existing amounts of mature jack pine (MIH 8), red and white pine (MIH 7), upland spruce/fir (MIH 6), upland conifer (MIH 5), and northern hardwood (MIH 3) are considerably below the amounts expected to occur under RNV. Meanwhile, the existing amount of aspen is well above the amount expected to occur under RNV.

Goals established by the Minnesota Forest Resources Council Landscape Committee are aimed at addressing most of the above mentioned differences by increasing the amount of mature/old forest, increasing the red and white pine (MIH 7) component, increasing the young jack pine (MIH 8) component, and decreasing the amount of aspen. The goals would generally move some existing forest conditions towards RNV.

Alternatives A and C

The cumulative effects of Alternatives A and C on MIH 1-10 (namely quantity of habitat) are almost identical, and would tend to move conditions away from the goals established by the Landscape Committee for the DLP. There would be no increase in MIH 8 (jack pine) or MIH 6 (spruce/fir) component. Furthermore, forest conditions in young MIH 1 (upland forest), MIH 2 (upland deciduous), and MIH 4 (aspen/birch) would continue to be maintained at levels two to four times above the amounts expected under the range of natural variability (RNV), maintaining population levels of associated species at similarly high levels above the amounts expected under RNV. At the highest levels, some of the favored species of the upland young deciduous forest habitats - such as deer - could have substantial adverse impacts on biological diversity.

Meanwhile, the overall amount of mature/old forest (of which old growth would be a component) would

not increase as envisioned by the Landscape Committee. Instead, amounts of mature/old forest in MIH 1 (upland forest), MIH 2 (upland deciduous) and MIH 4 (aspen/birch) would decrease dramatically below currently existing levels. The decreases in mature/old forest levels in MIHs 1 and 2 would place them well below amounts expected under RNV. The low levels of mature/old forest in these MIHs could adversely affect their associated species such as northern goshawk. In addition, amounts of mature/old forest in MIH 3 (northern hardwoods), MIH 5 (upland conifer), MIH 6 (upland spruce/fir), MIH 7 (red and white pine), and MIH 8 (jack pine) would remain well below amounts expected under RNV, as would the population levels of associated species. Overall, conditions in 8 of the 10 mature/old MIHs under these two alternatives might not provide adequate representation to maintain viable species' populations.

In addition, this region is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland (Appendix H: *Estimated Future Forest Conditions*). The cumulative effect of this loss in forestland and either Alternative A or Alternative C could have on negative effect on MIHs 1-10.

Alternative B

Dualplan indicates that forest conditions for MIH 1-10 on Chippewa National Forest land under Alternative B would help achieve some of the goals established by the Landscape Committee by increasing the amounts of those forest types that are currently under-represented in the DLP. By decade 10 there would be a slight increase in MIH 8 (jack pine) in both the young and mature/old categories over currently existing levels, placing jack pine within the lower limit of the expected RNV on National Forest land. In addition, the amount of mature/old MIH 6 (spruce/fir) and MIH 7 (red and white pine) would increase to within the upper limit of the amount expected under RNV by decade 10, and the young component of MIH 6 and MIH 7 would be within the lower limit of the amount expected under RNV.

Meanwhile, the overall amount of mature/old forest (of which old growth would be a component) would increase dramatically in some instances to be just within the upper limits of the amounts expected under RNV for all 10 MIH, accomplishing the goal of increasing mature/old forest across the DLP.

In addition, this region is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland (Appendix H). Alternative B could help compensate for cumulative adverse effects on other ownerships within the DLP.

Alternative D

Dualplan indicates that, with the exception of MIH 8 (jack pine), forest conditions for MIH 1-10 on Chippewa National Forest land under Alternative D would help achieve some of the goals established by the Landscape Committee. The amount of mature/old forest in all the MIHs would rise to levels within or above the amounts expected under RNV on National Forest land. There would be an almost three-fold increase in mature/old MIH 8 (jack pine) by decade 10, placing mature/old jack pine at levels nearly two and one-half times the amount expected under RNV on National Forest land. However, the amount of young jack pine would decrease to levels 35% below the amount expected under RNV on National Forest land by decade 10 and would not contribute to the Landscape Committee's goal of increasing young jack pine in the DLP.

Although the amounts of all 10 MIH in the mature/old category generally would rise to levels within or even above the amounts expected under RNV, the amount of young forest in all but 2 MIHs would decrease to levels 35% to 100% below the amounts expected under RNV. Dualplan indicates that there would be no young MIH 3 (northern hardwood), MIH 7 (red and white pine), or MIH 9 (lowland black spruce tamarack) by decade 10. However, Dualplan does not consider the effects of natural disturbances in its modeling calculations. Irregardless, Alternative D would not assist in actually increasing the jack pine, spruce/fir, or red and white pine component.

Meanwhile, the amount of mature/old MIH 2 (upland deciduous) and MIH 4 (aspen/birch) would decrease dramatically to levels expected under RNV.

In the long run, species associated with mature/old forest in MIHs 1-10 would be present in levels above the expected range of natural variability, while species associated with young forest in MIHs 1-10 would be present in levels well below the lower limit of the expected range of natural variability.

In addition, this region is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland (Appendix H). Alternative B could help compensate for cumulative adverse effects on other ownerships within the DLP.

Modified Alternative E

Dualplan indicates that forest conditions for MIH 1-10 on Chippewa National Forest land under Alternative E would not help achieve some of the goals established by the Landscape Committee. Although Alternative E would produce high levels of young MIH 8 (jack pine) in decade 2, it would produce very low amounts of young MIH 8 by decade 10. Therefore, there would be no overall increase in the MIH 8 (jack pine). Furthermore, forest conditions in young MIH 1 (upland forest), MIH 2 (upland deciduous), and MIH 4 (aspen/birch) would continue to be maintained at levels 2% to 40% above the amounts expected under the range of natural variability (RNV), resulting in population levels of associated species at similar levels above the amounts expected under RNV. This would be of more concern if decade 2 and 10 levels of young MIH 1, MIH 2, and MIH 4 were not showing more than a 50% decrease over existing levels, thus actually decreasing the amount of habitat for associated species.

There would, however, be a steady increase in the amount of mature/old MIH 7 (red and white pine) through decade 10, and an increase in young MIH 7 almost twice that of existing levels. This would assist in the Landscape Committee's goal of increasing the red and white pine component. However, the amount of MIH 7 present in decades 2 and 10 would still be 12% (decade 10) to 23% (decade 2) below RNV.

With the exceptions of MIHs 2 (upland deciduous), 4 (aspen / birch), 8 (jack pine), and 9 (lowland black spruce), the amount of mature/old forest would be 11% to 34% below RNV by decade 10.

Although this region is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due to constraints on management and harvest practices (Appendix H), the cumulative effect of this loss in forestland and Alternative E would probably have no adverse effect on species associated with MIHs 1-10.

Alternative F

Dualplan indicates that forest conditions for MIH 1-10 on Chippewa National Forest land under Alternative F would help achieve some of the desired future conditions for the DLP established by the Landscape Committee.

By decade 10, the amount of both young and mature/old forest in all 10 MIHs would be within the middle of their expected ranges of natural variability.

Although this region is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due to constraints on management and harvest practices (Appendix H), the cumulative effect of this loss in forestland and Alternative F could help compensate for cumulative adverse effects on other ownerships within the DLP.

Alternative G

Dualplan indicates that forest conditions for MIH 1-10 on Chippewa National Forest land under Alternative G would help achieve some of the goals for the DLP established by the Landscape Committee. There would be a two-fold increase in both young and

mature/old MIH 8 (jack pine) by decade 10, placing mature/old jack pine at levels almost two times the amount expected under RNV on National Forest land. Furthermore, although forest conditions in young MIH 1 (upland forest), MIH 2 (upland deciduous), and MIH 4 (aspen/birch) would continue to be maintained at levels 2%, 26%, and 31% (respectively) above the amounts expected under the range of natural variability (RNV), they would be much lower than the amounts of MIH 1, MIH 2, and MIH 4 that currently exist. The resulting population levels of associated species would be only slightly above the amounts expected under RNV when compared to current conditions.

In addition, there would be a steady increase in the amount of mature/old MIH 7 (red and white pine) through decade 10, and an increase in young MIH 7 almost twice that of existing levels. This would assist in the Landscape Committee's goal of increasing the red and white pine component.

Meanwhile, with the exception of MIH 4 (aspen/birch), and MIH 8 (jack pine), the overall amount of mature/old forest (of which old growth would be a component) would increase to be just below the amounts expected under RNV. However, the amount of mature/old aspen/birch would still be 32% above the amount expected under RNV.

Although this region is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due to constraints on management and harvest practices (Appendix H), the cumulative effect of this loss in forestland and Alternative G would probably have no adverse effect on species associated with young MIHs 1-10.

Superior NF

The Superior National Forest manages approximately 42% of the forested lands in the Northern Superior Uplands (NSU) Ecological Section. Table FAC-2 in the Vegetation Section (3.1) of this document displays a comparison of the existing amounts of forest types and age classes on the Superior National Forest and on all lands within the NSU to RNV values. The existing amounts of young jack pine (MIH 8) and mature/old red and white pine (MIH 7) and upland spruce/fir (MIH 6) are considerably below the amounts expected to occur under RNV. Meanwhile, the existing amount of mature/old aspen is well above the amount expected to occur under RNV.

Goals established by the Minnesota Forest Resources Council Landscape Committee are aimed at addressing most of the above mentioned differences by increasing the amount of forest in the multi-aged growth stages, increasing the white pine (MIH 7), white spruce (MIH 6), and lowland black spruce (MIH 9) forest components, and increasing jack pine (MIH 8).

The BWCAW contributes approximately 762,000 acres of forest to the Superior National Forest and to the NSU. This acreage represents approximately 34% of the forested acres on the Superior and 15% of the forest acres within the NSU. In any discussion of cumulative effects on the Superior, it is important to remember that all MIH and RNV calculations were derived from forest acreage and composition inside and outside of the BWCAW combined. This is important because, starting as early as decade 1 the existing large amount of young forest in the BWCAW associated with the 1999 windstorm will grow out of the young forest category. In the upland forest category (MIH 1) the amount of young forest will drop 92% in the BWCAW by decade 2, moderating the impact of relatively high amounts of young forest resulting from management activities outside the BWCAW

Similarly, by decade 10, the existing composition of old/mature forest in the BWCAW changes rather dramatically as the upland deciduous MIHs (MIH 2 and 4) and the jack pine MIH (MIH 8) succeed into late successional conifer MIHs, particularly MIH 5 (upland conifer) and MIH 6 (upland spruce/fir). To a lesser extent, currently existing young and pole/immature stage red and white pine (MIH 7) and lowland black spruce (MIH 9) would grow into the old/mature stage, increasing the ranks of old/mature forest in these MIH as well. These increases in upland conifer and decreases in aspen/birch inside the BWCAW will appear to moderate the overall impact

of harvesting old/mature forest levels in conifer MIHs outside of the BWCAW and amplify the impact of harvesting old/mature deciduous and aspen/birch MIHs outside of the BWCAW. The complete opposite is true in those Alternatives with lower harvesting levels.

The effects inside the BWCAW would be the same in each of the alternatives.

Alternatives A and C

On the Superior, the effects of Alternatives A and C on MIH 1-10 (namely quantity of habitat) are almost identical.

Modeling results indicate that conditions for some MIH 1-10 on the Superior National Forest under Alternatives A and C would not help achieve some of the desired future conditions for the NSU established by the Landscape Committee. Chief among these is the goal to increase MIH 8 (jack pine), maintain jack pine composition where it currently exists, and re-establish jack pine as a major component where it is not present or where it is a minor component. Under Alternative C, the amount of young MIH 8 would increase to levels within the amount expected under RNV. However, under Alternative A, the amount of young MIH 8 would decrease steadily from currently existing levels that are already 23% below the amount expected under the range of natural variability (RNV), to levels 45% below the amount expected under RNV. Similarly, the amount of mature/old MIH 8 under Alternatives A and C would decrease even more dramatically from existing levels. However, existing levels of mature/old jack pine are currently 47% higher than the amount expected under RNV. By decade 10, the amount of mature/old jack pine would be approximately 8% below the amount expected under RNV.

MIHs with currently existing habitat levels below those expected under RNV would, in general, increase but still be present in quantities below those expected under RNV at decade 10. This is particularly true in the mature/old category. The overall amount of mature/old forest (of which old growth would be a component) would not increase as envisioned by the Landscape Committee. Instead, amounts of mature/old forest in MIH 2 (upland deciduous) and MIH 4 (aspen/birch) would decrease dramatically (96% to 97%) below currently existing levels outside the BWCAW. However, because of the moderating effect of mature forest conditions inside the BWCAW, the decreases in mature/old forest levels would place the overall amounts of mature/old MIH 2 and MIH 4 only 20% below amounts expected under RNV by decade 10. The lower levels of mature/old forest in these MIHs could negatively affect their associated species such as northern goshawk, boreal owl, and black-throated blue warbler, especially in areas outside the BWCAW, where concern for the species would be related to the loss of well-distributed habitats.

Meanwhile, the amount of young forest in MIH 2 (upland deciduous), MIH 4 (aspen/birch) would remain 20% to 30% higher than the amounts expected under RNV, despite a four-fold decrease inside the BWCAW. This would tend to maintain population levels of associated species at similarly higher levels above the amounts expected under RNV. Outside of the BWCAW, population levels of some of the favored species of the upland young deciduous forest habitats – such as deer – could have substantial negative impacts on biological diversity.

As in the DLP on the Chippewa, the NSU is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due primarily to recreation-related development along the North Shore in the southern part of this region (Jaakko Poyry 1994). When combined with the moderating effects of the BWCAW, the effect of Alternatives A and C and this loss in timberland (but not necessarily forestland) would have the cumulative effect of maintaining levels of young MIHs above the amounts expected under RNV and maintaining levels of mature/old MIHs below the amounts expected under RNV. Cumulatively, some MIHs outside of the BWCAW could be negatively impacted.

Alternative B

Modeling results indicate that by decade 10, conditions for MIH 1-10 on the Superior would help achieve the goals established for the NSU by the Landscape Committee. By decade 10, the conditions for MIH 1-10 would fall within the lower limit of the amounts expected under the range of natural variability for the young forest category, and within the upper limit of the amounts expected under RNV for the mature/old forest category. This would meet the MFRC Landscape Committee goal of moving toward RNV.

Although the currently existing amount of mature/old MIH 7 (red and white pine) would more than double by decade 10, the amount of young MIH 7 would drop approximately 88% from currently existing levels. Similarly, the amount of mature/old MIH 6 (upland spruce/fir) would nearly quadruple by decade 10, however, the amount of young MIH 6 would drop approximately 96% from current levels. These large discrepancies are caused by the successional effects inside the BWCAW. Although these young MIHs would still fall within the lower limits of the amounts expected under RNV, this would indicate no net gain (increase in young habitat) in either MIH 6 or MIH 7 forest components.

Meanwhile, because of the moderating effect of mature forest conditions inside the BWCAW, the decreases in mature/old forest levels in MIH 2 (upland deciduous) and MIH 4 (aspen/birch) would place the overall amounts of mature/old forest within the amounts expected under RNV by decade 10. This would equate to an 85% to 86% decrease in mature/old MIH 2 and MIH 4 Forest-wide outside of the BWCAW. The lower levels of mature/old forest in these MIHs could negatively affect their associated species such as northern goshawk, boreal owl, and black-throated blue warbler outside the BWCAW.

The NSU is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due primarily to recreation-related development along the North Shore in the southern part of this region (Appendix H). Alternative B could help compensate for cumulative negative effects on other ownerships within the NSU. However, although the cumulative effect of Alternative B and this loss in timberland (but not necessarily forestland) would probably have no overall negative effects on MIH 1-10 when combined with the moderating effects of the BWCAW, some MIHs outside of the BWCAW (and thus their associated species) could be negatively impacted.

Alternative D

Although the amounts of all 10 MIH in the mature/old category generally would rise to levels above the amounts expected under RNV, the amount of young forest in all but 4 MIHs would decrease to levels 53% to 88% below the amounts expected under RNV. Modeling indicates that there would be no young MIH 3 (northern hardwood), MIH 7 (red and white pine), or MIH 9 (lowland black spruce tamarack) located outside of the BWCAW by decade 10. However, Dualplan (model used outside the BWCAW) does not consider the effects of natural disturbances in its modeling calculations. Regardless, Alternative D would not assist in actually increasing the spruce/fir, red and white pine, or tamarack component. There would, however, be an increase in the young jack pine component.

Meanwhile, because of the moderating effect of mature forest conditions inside the BWCAW, the decreases in mature/old forest levels in MIH 2 (upland deciduous) and MIH 4 (aspen/birch) would place the overall amounts of mature/old forest within the amounts expected under RNV by decade 10. This would equate to a 69% to 70% decrease in mature/old MIH 2 and MIH 4 in areas outside of the BWCAW. The lower levels of mature/old forest in these MIHs could negatively affect their associated species such as northern goshawk, boreal owl, and black-throated blue warbler outside the BWCAW.

In the long run, species associated with mature/old forest in MIHs 1-10 would be present in levels above the expected range of natural variability, while species associated with young forest in MIHs 1-10 would be present in levels below the lower limit of the expected range of natural variability.

The NSU is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due primarily to recreation-related development along the North Shore in the southern part of this region (Appendix H). Alternative D could help compensate for cumulative negative effects on other ownerships within the NSU. However, although the cumulative effect of Alternative D and this loss in timberland (but not necessarily forestland) would probably have no overall negative effects on MIH 1-10 when combined with the moderating effects of the BWCAW, some MIHs outside of the BWCAW (and thus their associated species) could be negatively impacted.

Modified Alternative E

Modeling results indicate that by decade 10, conditions for MIH 1-10 on the Superior would help achieve the goals established for the NSU by the Landscape Committee. By decade 10, the conditions for all but two of MIH 1-10 would fall within the upper limits of the amounts expected under the range of natural variability for the young forest category, and within or only very slightly above or below the amounts expected under RNV for the mature/old forest category. The only two exceptions would be in young MIH 7 (red and white pine) and mature/old MIH 2 (upland deciduous). For MIH 7, the amount of young forest would be 44% more than the amount expected under RNV. While for MIH 2, the amount of mature/old forest would be 31% above the amount expected under RNV.

Although there would be an overall 49% decrease in the amount of young MIH 7 (red and white pine) from currently existing levels, because of successional effects inside the BWCAW, the amount of young MIH 7 in decade 10 of Modified Alternative E would actually increase approximately 22% above existing levels outside of the BWCAW. This would result in a net increase in red and white pine.

The successional effects inside the BWCAW would moderate the amount of young MIH 8 (jack pine) that would be produced. Under Modified Alternative E, the amount of young jack pine outside the BWCAW would nearly double by decade 10. This would bring the amount of young MIH 8 within the amount expected under RNV, and result in a net gain of the jack pine component.

Meanwhile, because of the moderating effect of mature forest conditions inside the BWCAW, the decreases in mature/old forest levels would place the overall amounts of mature/old MIH 2 and MIH 4 within the amounts expected under RNV by decade 10. This would equate to an 86% to 87% decrease in mature/old MIH 2 and MIH 4 in areas outside of the BWCAW. The lower levels of mature/old forest in these MIHs could negatively affect their associated species such as northern goshawk, boreal owl, and black-throated blue warbler outside the BWCAW.

The NSU is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due primarily to recreation-related development along the North Shore in the southern part of this region (Appendix H). Modified Alternative E could help compensate for cumulative negative effects (including the loss or reduction of jack pine and white pine components) on other ownerships within the NSU. However, although the cumulative effect of Modified Alternative E and this loss in timberland (but not necessarily forestland) would probably have no overall negative effects on MIH 1-10 when combined with the moderating effects of the BWCAW, some MIHs outside of the BWCAW (and thus their associated species) could be negatively impacted.

Alternative F

Modeling results indicate that by decade 10, conditions for MIH 1-10 on the Superior would help achieve the goals established for the NSU by the Landscape Committee. By decade 10, the conditions for all MIH 1-10 would fall within the middle of the amounts expected under the range of natural variability for both the young and mature/old forest categories.

Although the currently existing amount of mature/old MIH 7 (red and white pine) would more than double

by decade 10, the amount of young MIH 7 would drop approximately 80% from currently existing levels. Similarly, the amount of mature/old MIH 6 (upland spruce/fir) would triple by decade 10, however, the amount of young MIH 6 would drop approximately 95% from current levels. These large discrepancies are caused by the successional effects inside the BWCAW. As described above, the amount of young forest in these two MIHs would be within the amounts expected under RNV.

The successional effects inside the BWCAW would also moderate the amount of young MIH 8 (jack pine) that would be produced. Under Alternative F, the amount of young jack pine outside the BWCAW would more than double by decade 10. This would bring the amount of young MIH 8 within the amount expected under RNV, and result in a net gain of the jack pine component.

Meanwhile, because of the moderating effect of mature forest conditions inside the BWCAW, the decreases in mature/old forest levels would place the overall amounts of mature/old MIH 2 and MIH 4 within the amounts expected under RNV by decade 10. This would equate to an 87% to 88% decrease in mature/old MIH 2 and MIH 4 in areas outside of the BWCAW. The lower levels of mature/old forest in these MIHs could negatively affect their associated species such as northern goshawk, boreal owl, and black-throated blue warbler outside the BWCAW.

The NSU is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due primarily to recreation-related development along the North Shore in the southern part of this region (Appendix H). Alternative F could help compensate for cumulative negative effects on other ownerships within the NSU simply by achieving RNV. However, although the cumulative effect of Alternative F and this loss in timberland (but not necessarily forestland) would probably have no overall negative effects on MIH 1-10 when combined with the moderating effects of the BWCAW, some MIHs outside of the BWCAW (and thus their associated species) could be negatively impacted.

Alternative G

Modeling results indicate that by decade 10, conditions for MIH 1-10 on the Superior would help achieve the goals established for the NSU by the Landscape Committee. By decade 10, the conditions for all but two of MIH 1-10 would fall within the upper limits of the amounts expected under the range of natural variability for the young forest category. and within or only very slightly above or below the amounts expected under RNV for the mature/old forest category. The only two exceptions would be in young MIH 7 (red and white pine) and in young and mature/old MIH 8 (jack pine).

Although the currently existing amount of mature/old MIH 7 (red and white pine) would more than double by decade 10, the amount of young MIH 7 would drop approximately 69% from currently existing levels. Similarly, the amount of mature/old MIH 6 (upland spruce/fir) would triple by decade 10, however, the amount of young MIH 6 would drop approximately 95% from current levels. These large discrepancies are exacerbated by the successional effects inside the BWCAW. The amount of young forest in MIH 6 would be within the amount expected under RNV. As described above, the amount of young forest in MIH 7 would be 9% above the amount expected under RNV.

The successional effects inside the BWCAW would also illuminate the small amount of young MIH 8 (jack pine) that would be produced under Alternative G. The amount of young jack pine would be 86% below the amount expected under RNV by decade 10.

Meanwhile, because of the moderating effect of mature forest conditions inside the BWCAW, the decreases in mature/old forest levels would place the overall amounts of mature/old MIH 2 and MIH 4 very close to (6% above) the amounts expected under RNV by decade 10. This would equate to an 82% to 83% decrease in mature/old MIH 2 and MIH 4 in areas outside of the BWCAW. The lower levels of mature/old forest in these MIHs could negatively affect their associated species such as northern goshawk, boreal owl, and black-throated blue warbler outside the BWCAW.

The NSU is expected to see an overall decrease in upland forestland and a significant reduction in the amount of forestland that is timberland due primarily to recreation-related development along the North Shore in the southern part of this region (Appendix H). Cumulatively, Alternative G would cause the reduction and could cause the eventual loss of MIH 8 (jack pine). In addition, some MIHs outside of the BWCAW (MIH 2 and MIH 4) could be negatively impacted.